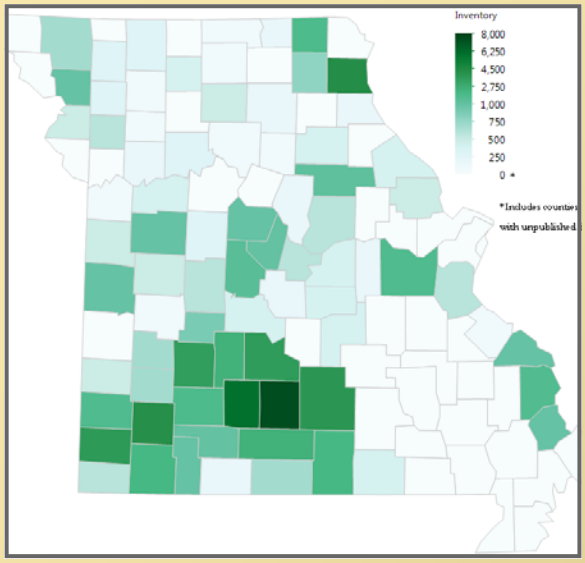
January 2015



Missouri Dairy Industry Revitalization Study

Section 1: Historical Perspective

UNIVERSITY OF MISSOURI
Extension
Commercial Agriculture Program

Missouri Dairy Industry Revitalization Study – *Section 1: Historical Perspective*

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Other publications from this study include:

Executive Summary

Section 2: Economic Contribution

Section 3: Needs Assessment

Section 4: Value Chain, Marketing and Processing

Section 5: Comparative Analysis to Identify Gaps

Complete copies of all publications can be found at http://dairy.missouri.edu/revitalization/.

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Missouri Dairy Industry Revitalization Study
Section 1: Historical Perspective

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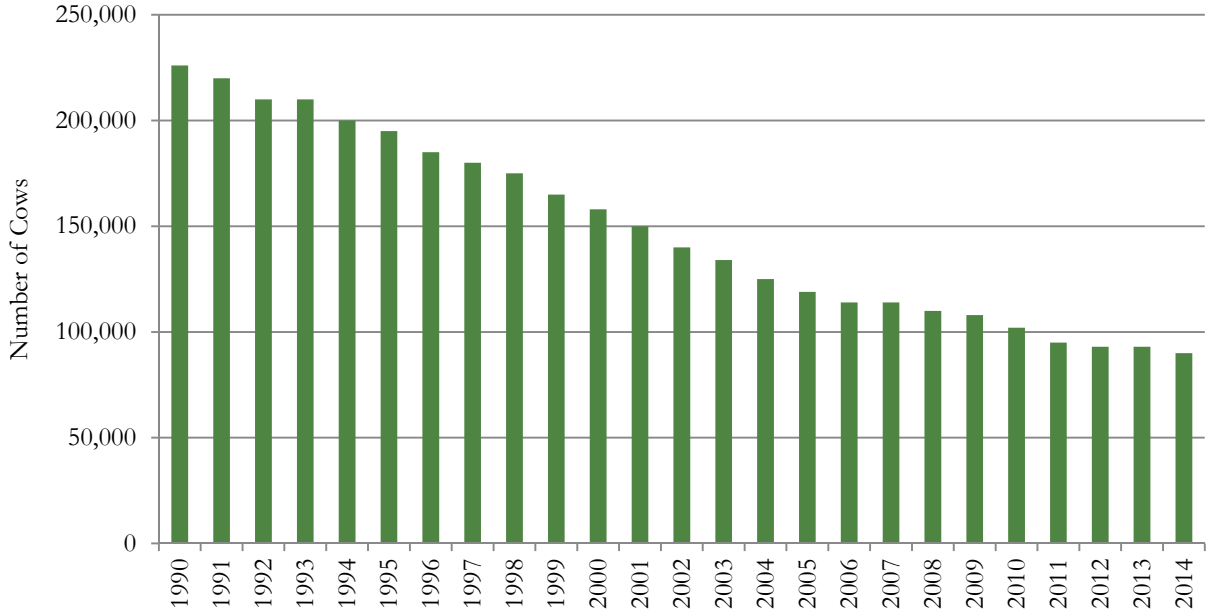
1. Dairy Cow Inventory

The Missouri dairy cow inventory has decreased substantially during the past two decades. Exhibit 1.1 presents the Missouri dairy inventory trend for the past 25 years on Jan. 1 of each given year. During the 1990s and 2000s, the state's dairy cow inventory sharply declined. Since 2010, however, the inventory reductions have slowed. In 1990, Missouri farms maintained 226,000 milk cows. By 2014, the state's milk cow inventory had dropped 60.2 percent to 90,000 milk cows.

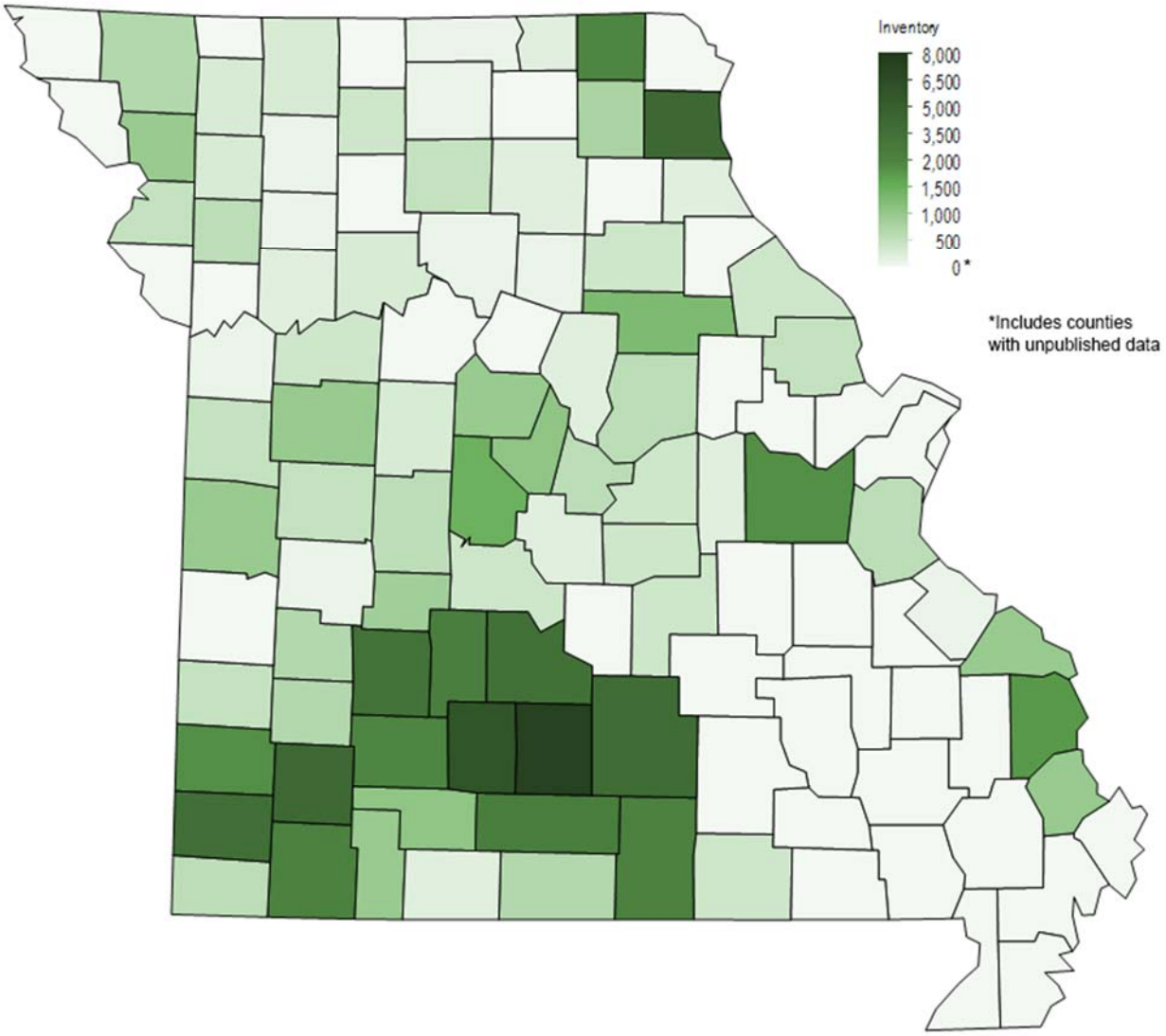
Exhibit 1.1 – Missouri Milk Cow Inventory, Jan. 1 Inventory, 1990 to 2014



Source: USDA, National Agricultural Statistics Service

Dairy cows are located throughout Missouri. However, the Missouri milk cow population tends to concentrate in the state's southwest and south central regions. During 2013, the five Missouri counties with the largest dairy cow inventories were Wright, Webster, Lawrence, Texas and Newton counties, though not all counties were reported. Exhibit 1.2 illustrates the distribution of dairy cows by county in 2013. Counties colored in white had fewer than 100 milk cows, or to avoid disclosing individual operation data, USDA didn't report data for the given county. Additionally, the authors added data for two counties that were not previously included based on personal knowledge. The appendix of this report includes USDA-reported dairy cow inventory data for each county.

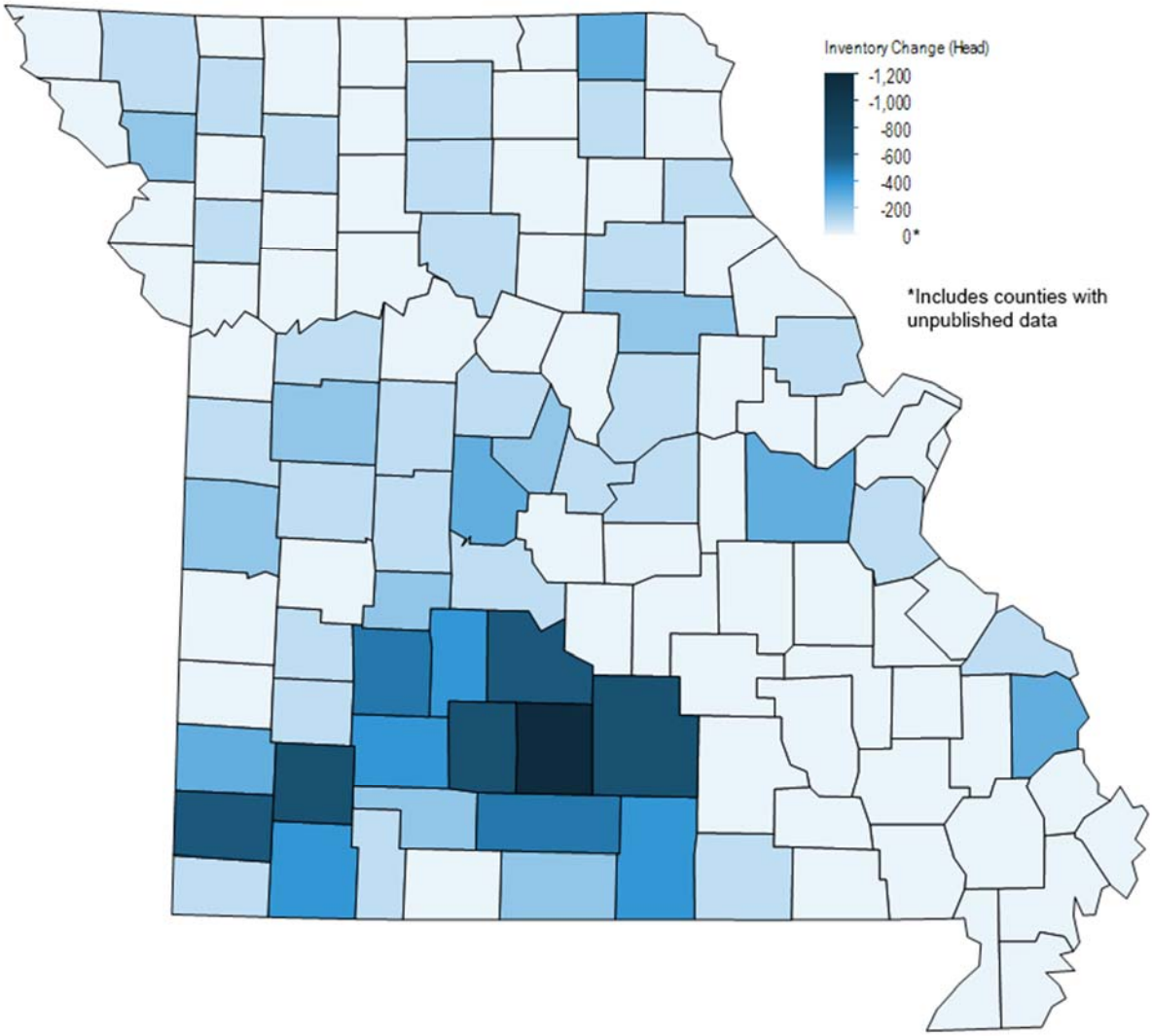
Exhibit 1.2 – Missouri Milk Cow Inventory by County, Jan. 1, 2013



Source: USDA, National Agricultural Statistics Service

Although many Missouri counties have recently experienced milk cow inventory reductions, the inventory changes have been most significant in south central and southwest Missouri. Exhibit 1.3 illustrates the change in Missouri milk cow inventory by county. Between 2009 and 2013, Missouri counties that decreased their milk cow inventories the most were Wright County, 1,200-cow reduction; Webster County, 900-cow reduction; Lawrence County, 700-cow reduction; Texas County, 700-cow reduction; Laclede County, 600-cow reduction; and Newton County, 600-cow reduction. Despite these counties leading the state in milk cow inventory contraction, they were still the state's six top counties for milk cow inventory in 2013. More than 20 counties didn't have a change in their milk cow inventory between 2009 and 2013.

Exhibit 1.3 – Missouri Milk Cow Inventory by County, Change from 2009 to 2013 (5-Year), Number of Cows



Source: USDA, National Agricultural Statistics Service

On Jan. 1, 2014, Missouri's dairy herd represented 1 percent of total U.S. milk cow inventory. Exhibit 1.4 lists dairy cow inventory data for Missouri and its surrounding states, and it also shares each state's milk cow inventory as a share of U.S. inventory. Of Missouri and its surrounding states, those with the largest milk cow inventories, as a share of the total U.S. herd, were Iowa, 2.2 percent; Kansas, 1.5 percent; Illinois, 1 percent; and Missouri, 1 percent. Missouri and its surrounding states collectively represented 8.1 percent of the U.S. dairy herd on Jan. 1, 2014. A decade earlier, they maintained nearly 10 percent of the U.S. herd on Jan. 1, 2004, which indicates that they decreased their share of the U.S. dairy cow herd by nearly 2 percentage points between 2004 and 2014.

Exhibit 1.4 – Milk Cow Inventory in Missouri and Surrounding States, Jan. 1, 2014

State	Inventory	% of U.S. Inventory
Iowa	205,000	2.2%
Kansas	136,000	1.5%
Illinois	96,000	1.0%
Missouri	90,000	1.0%
Kentucky	68,000	0.7%
Nebraska	53,000	0.6%
Tennessee	46,000	0.5%
Oklahoma	45,000	0.5%
Arkansas	8,000	0.1%

Source: USDA, National Agricultural Statistics Service

California, Wisconsin and New York led as the three U.S. states that maintained the largest dairy cattle inventories on Jan. 1, 2014. Their shares of the total U.S. inventory were 19.3 percent, 13.8 percent and 6.7 percent, respectively, in 2014. See Exhibit 1.5. Other states that were home to at least 5 percent of the U.S. milk cow inventory on Jan. 1, 2014, were Idaho, 6.1 percent; Pennsylvania, 5.8 percent; and Minnesota, 5 percent. Collectively, the top 10 states for milk cow inventory represented 72 percent of the U.S. dairy cattle herd at the beginning of 2014.

Exhibit 1.5 – Top 10 States for Milk Cow Inventory, Jan. 1, 2014

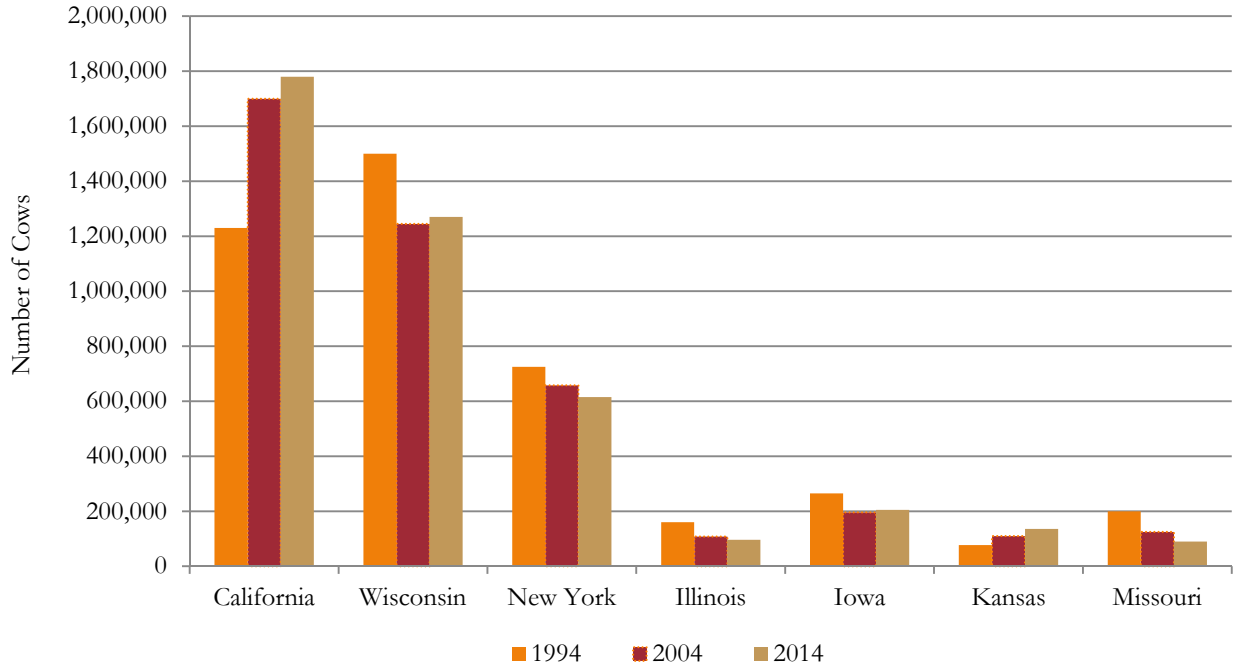
State	Inventory	% of U.S. Inventory
California	1,780,000	19.3%
Wisconsin	1,270,000	13.8%
New York	615,000	6.7%
Idaho	565,000	6.1%
Pennsylvania	530,000	5.8%
Minnesota	460,000	5.0%
Texas	440,000	4.8%
Michigan	381,000	4.1%
New Mexico	323,000	3.5%
Ohio	267,000	2.9%

Source: USDA, National Agricultural Statistics Service

In 2004, the same states ranked in the top 10 for milk cow inventory, though the order for some states varied somewhat in 2004 compared with 2014. Based on Jan. 1, 2004, data, the top 10 states for milk cow inventory represented 69.5 percent of the total U.S. dairy herd. Thus, these states increased their share of the U.S. dairy herd by 2.5 percentage points between 2004 and 2014, and the U.S. dairy industry became more geographically concentrated.

Exhibit 1.6 illustrates milk cow inventory of the past three decades for the three top dairy cow states in the U.S., the three top dairy cow states that border Missouri and Missouri itself. The graphic indicates that three of the selected states reduced their dairy cow inventories each period during the observed time period: New York, Illinois and Missouri. California and Kansas increased their dairy cow inventory from 1994 to 2004 and from 2004 to 2014. For Wisconsin and Iowa, dairy cow inventory dropped from 1994 to 2004, but it rebounded slightly from 2004 to 2014.

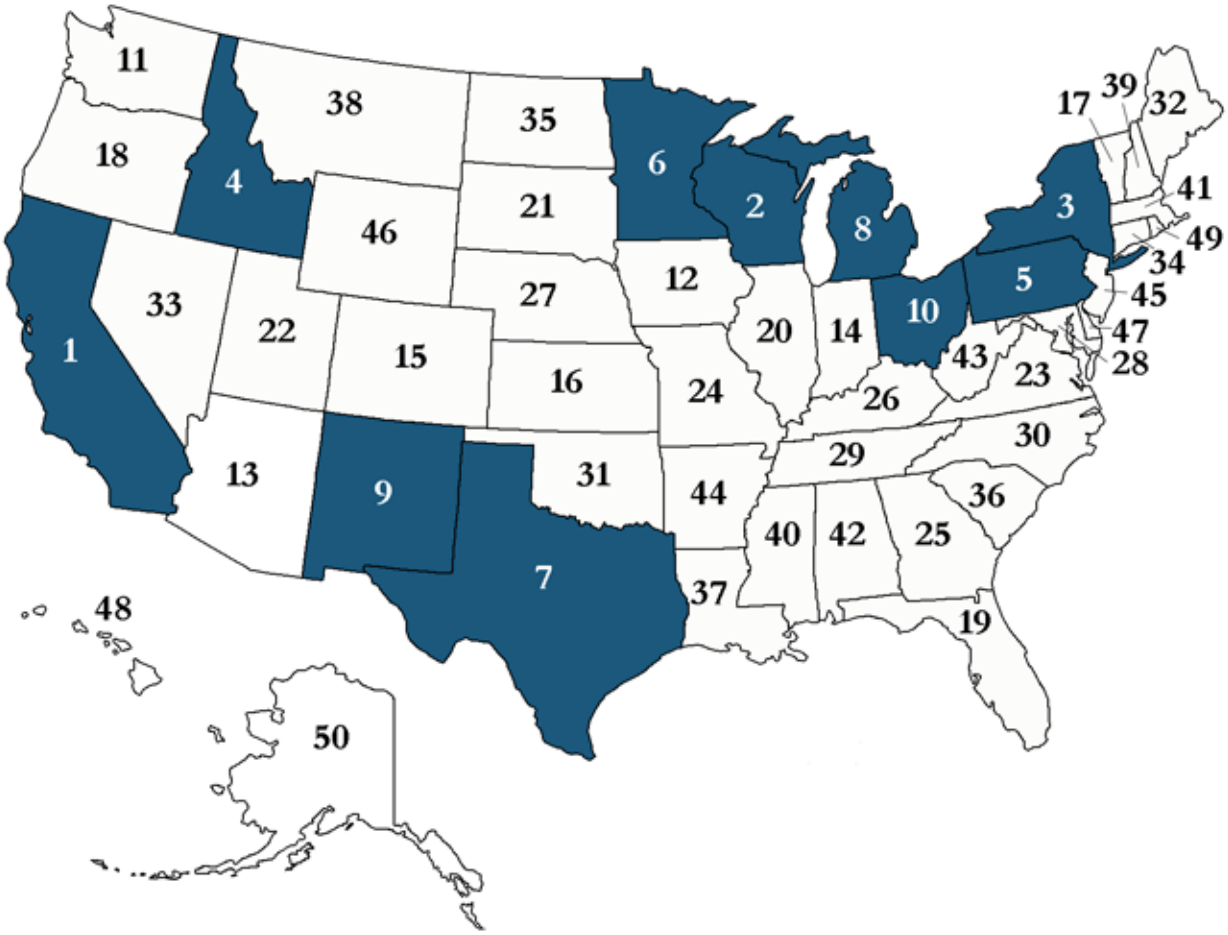
Exhibit 1.6 - Milk Cow Inventory for Selected States, Jan. 1, 1994, 2004 and 2014



Source: USDA, National Agricultural Statistics Service

Graphically, Exhibit 1.7 illustrates each state's rank for milk cow inventory on Jan. 1, 2014, and it highlights states ranked in the top 10 for milk cow inventory. The top 10 states concentrate in the West, Great Lakes, mid-Atlantic and Southwest regions. Missouri ranked as No. 24 for milk cow inventory. Of the states that neighbor Missouri, Iowa and Kansas had the higher rankings – No. 12 and No. 16, respectively – for dairy cow inventory on Jan. 1, 2014.

Exhibit 1.7 - Milk Cow Inventory, Jan. 1, 2014, Rankings by State and Top 10 States Highlighted



Source: USDA, National Agricultural Statistics Service

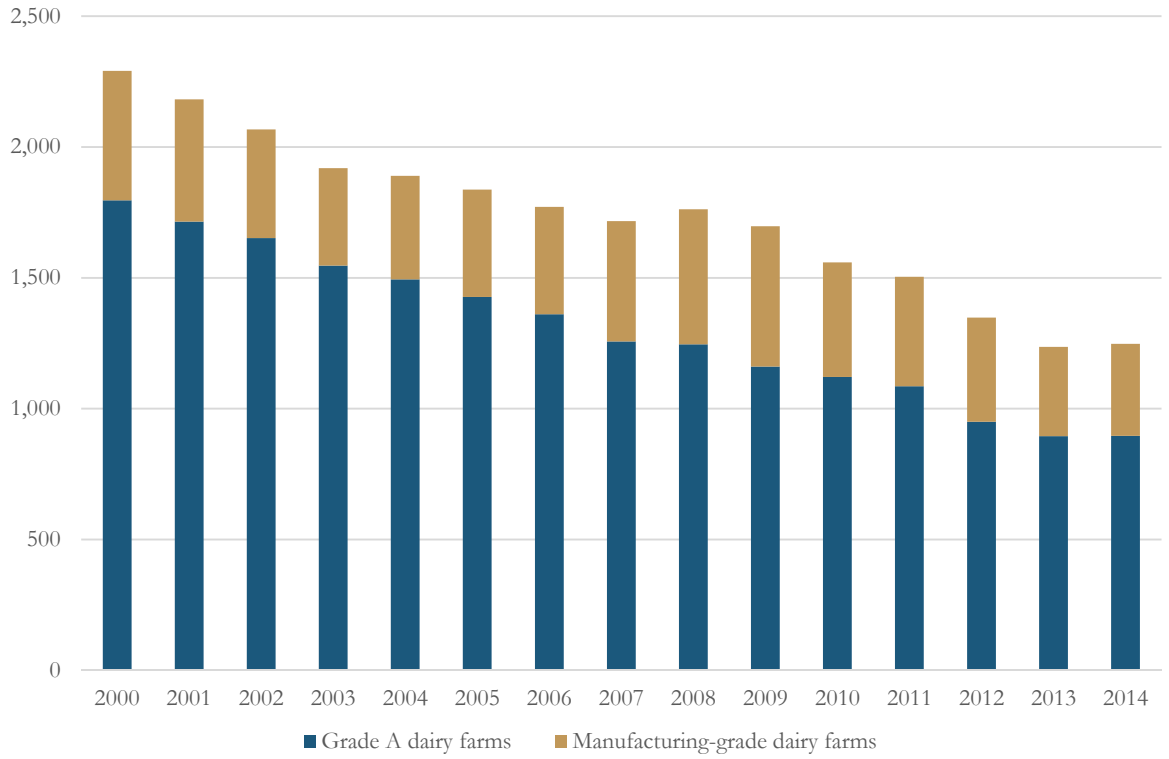
2. Dairy Farms

2.1 Number of Farms

In Missouri, commercial dairy farms either sell permitted "Grade A" milk or "manufacturing grade" milk. Grade A milk refers to milk produced under conditions to meet fluid milk consumption standards. Manufacturing grade milk refers to milk that does not meet the conditions for fluid milk consumption and can be used in cheese, butter and nonfat dry milk.

In December 2014, 1,248 permitted dairy farms operated in Missouri. Of these, 896 were Grade A dairy farms, and 352 were manufacturing-grade dairy farms, which mostly included Amish operations and some goat or sheep dairies. Since 2000, the number of commercial dairy farms operating in Missouri has consistently declined. See Exhibit 2.1.1. Between 2000 and 2014, the total number of Missouri commercial dairies decreased by 45.5 percent. Only three percent of the milk marketed in Missouri was from manufacturing-grade operations in the year 2013. As of December 2014, the closing of cheese plants in Missouri and nearby states casts doubts of the long-term marketability of Missouri manufacturing-grade milk.

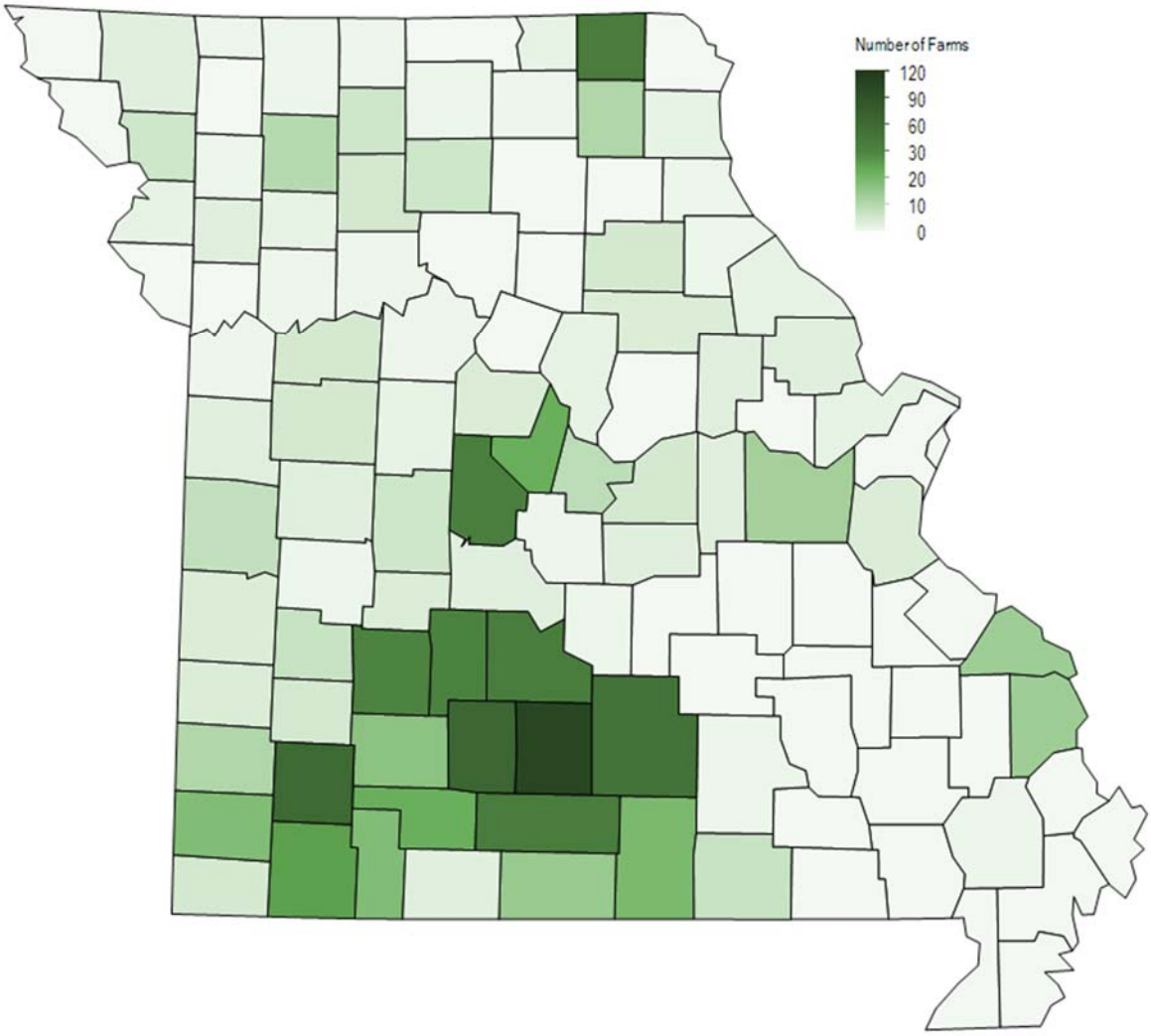
Exhibit 2.1.1 – Number of Missouri Commercial Dairy Operations in Missouri, 2000 to 2014



Source: Missouri State Milk Board

Exhibit 2.1.2 presents the number of Grade A dairy farms, which market milk within the federal order marketing system. During December 2012, the counties with the most farms marketing milk within the federal order system were Wright County, 108 farms; Webster County, 67 farms; Lawrence County, 64 farms; Texas County, 52 farms; Scotland County, 41 farms; and Douglas County, 41 farms. Missouri counties that have the most Grade A dairy farms also tend to rank highly in milk cow inventory. Of the six counties ranked highest for dairy farms with federal order milk marketings during December 2012, four ranked in the top five Missouri counties for milk cow inventory on Jan. 1, 2013. The appendix of this report lists the number of Grade A farms by county from 2000 to 2012.

Exhibit 2.1.2 –Missouri Farms with Federal Order Milk Marketings, December 2012



Source: Central Milk Market Administrator's Office

2.2 Farm and Herd Characteristics

For Missouri, the 2012 U.S. Census of Agriculture reported that 1,153 farms operated in the dairy cattle and milk production industry, designated by the North American Industry Classification System code 11212. Exhibit 2.2.1 summarizes some characteristics of the Missouri farms in this industry. In 2012, these farms maintained 407,812 acres, and they harvested 157,463 acres of cropland. On average, the market value of land and building capital assets per farm exceeded $815,000, and the machinery and equipment capital asset market value per farm was more than $131,000. The "Per Cow" column represents the "Total" column numbers divided by the milk cow inventory or average herd size in Missouri.

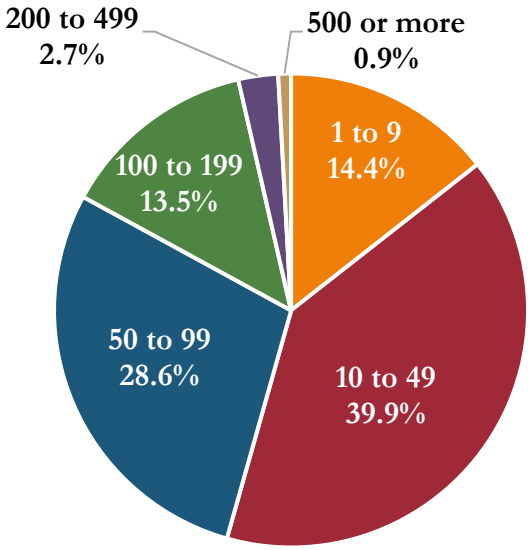
Exhibit 2.2.1 – Characteristics of Missouri Dairy Cattle and Milk Production Farms by NAICS Classification System (11212), 2012

	Total	Per Cow	Units
Farms	1,153		farms
Land in farms	407,812	4.86	acres
Harvested cropland	157,463	1.88	acres
Estimated average market value of land and buildings per farm	$815,062	$11,165	dollars
Estimated average market value of machinery and equipment per farm	$131,073	$1,796	dollars
Market value of agricultural products sold, total sales	$290,236	$3,976	thousand dollars

Source: Derived from USDA, National Agricultural Statistics Service, Census of Agriculture

Of the Missouri farms included in the dairy cattle and milk production NAICS category, the census found that 68.5 percent had operations with 10 milk cows to 99 milk cows. Exhibit 2.2.2 illustrates the distribution of Missouri dairy cattle and milk production farms by their milk cow inventory. Based on these data, 17.1 percent of farms had at least 100 milk cows, and 14.4 percent of farms had fewer than 10 milk cows. Most farms with one to nine cows are Amish operations, family operations producing milk for home consumption or operations with nurse cows for bottle calves.

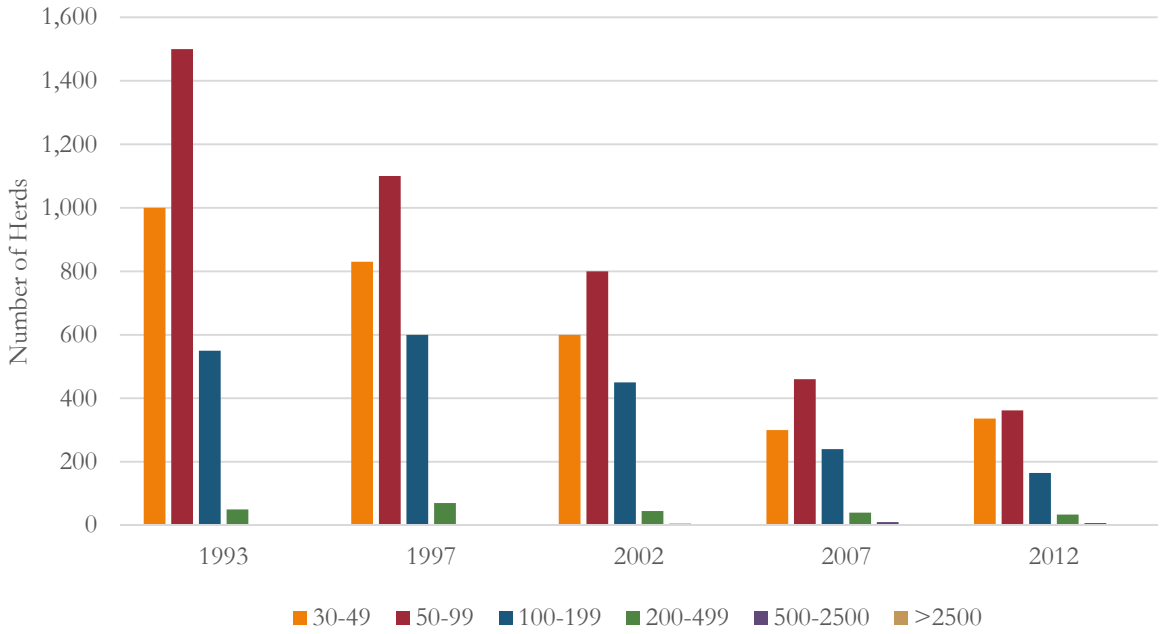
Exhibit 2.2.2 – Milk Cow Inventory Distribution of Missouri Dairy Cattle and Milk Production Farms by NAICS Classification System (Code 11212), 2012



Source: USDA, National Agricultural Statistics Service, Census of Agriculture

Exhibit 2.2.3 illustrates changes in Missouri dairy farm herd size distribution from 1993 to 2012. In all years observed, Missouri herds were predominantly 50- to 99-cow operations. During the time period analyzed, however, the differences in number of herds with 50 to 99 cows and number of herds in other size categories have narrowed. In 2012, Missouri recorded 336 herds with 20 to 49 cows, 362 herds with 50 to 99 cows, 165 herds with 100 to 199 cows, 34 herds with 200 to 499 cows, seven herds with 500 to 2,500 cows and three herds with more than 2,500 cows.

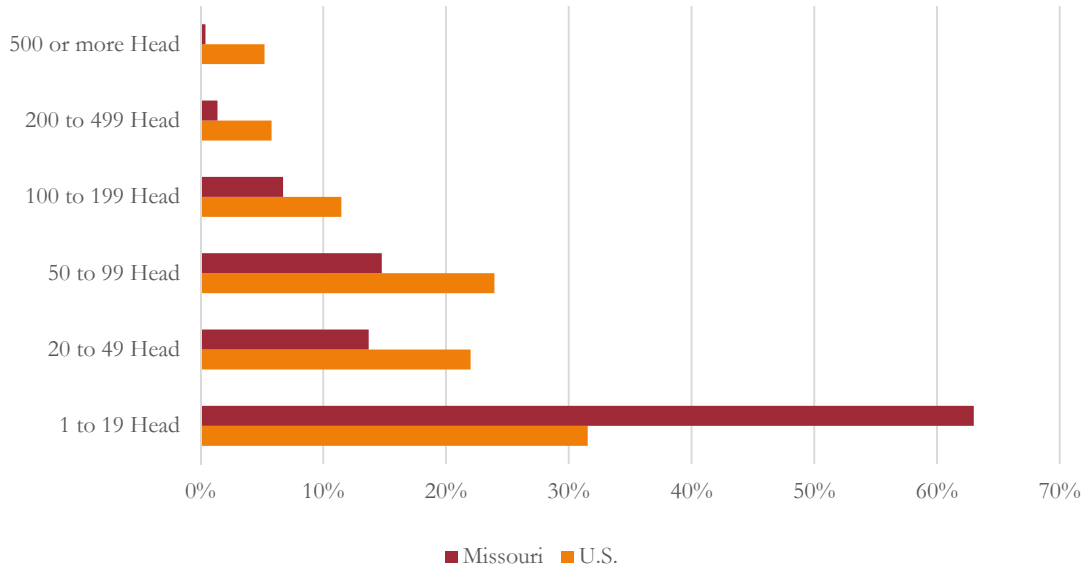
Exhibit 2.2.3 – Missouri Dairy Farm Herd Size Distribution, 1993 to 2012



Notes: Prior to 2000, 500 was the top herd size. Beginning in 2012, the 30-49 category shifted to 20-49 head category
Source: USDA, National Agricultural Statistics Service

To compare Missouri and U.S. dairy herds, Exhibit 2.2.4 evaluates the two based on the percent of operations that fit into various herd size categories during 2012. In all categories shown in Exhibit 2.2.4 – they range from 20 to 49 head to 500 or more head – the U.S. has a greater share of operations reporting the various herd sizes. Based on these data, relatively small shares of Missouri and U.S. dairy herds have more than 100 head. Instead, greater shares reported herd sizes in the smaller two categories. For example, 14.8 percent of Missouri operations and 23.9 percent of U.S. operations reported herd sizes that ranged from 50- to 99-head. In Missouri, 13.7 percent of operations shared that they have a 20- to 49-head herd size, and 22 percent of U.S. operations identified that their herd size was in this range. Missouri only has a few operations larger than 500 cows.

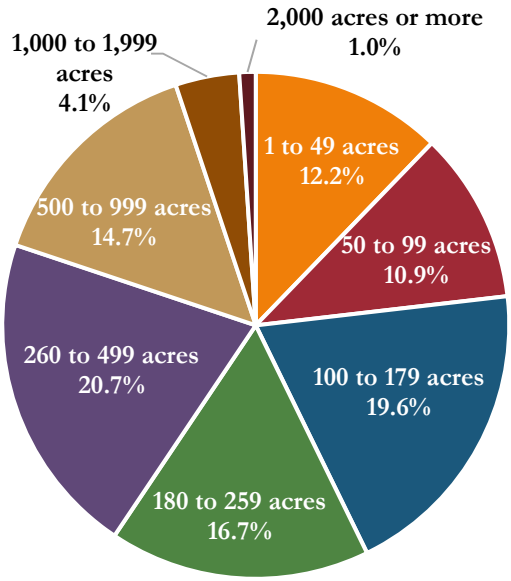
Exhibit 2.2.4 – Missouri and U.S Dairy Herd Size Distribution, Pct. of Operations, 2012



Source: USDA, National Agricultural Statistics Service, Census of Agriculture

Missouri dairy cattle and milk production farms have diverse land holdings. Exhibit 2.2.5 shares the distribution of these farms by acreage category. In 2012, 57 percent of Missouri dairy cattle and milk production farms maintained between 100 acres and 499 acres, 23.1 percent maintained less than 100 acres and 19.8 percent maintained at least 500 acres in 2012.

Exhibit 2.2.5 – Acreage of Missouri Dairy Cattle and Milk Production Farms by NAICS Classification System (11212), 2012



Source: USDA, National Agricultural Statistics Service, Census of Agriculture

2.3 Dairy Farm Operator Characteristics

Missouri dairy principal operators are predominantly white. Exhibit 2.3.1 shares Missouri principal operator race, gender, ethnicity and primary occupation data from 2012. Regarding race, three Missouri principal dairy operators reported having American Indian or Alaska Native heritage, and five principal operators reported more than one race. Otherwise, all others reported being white. Of the 1,153 principal dairy farm operators in Missouri during 2012, 7.5 percent were women. Just eight principal operators reported having Spanish, Hispanic or Latino origin. Of the Missouri principal operators in the dairy cattle and milk production farms industry, 79.4 percent indicated that farming was their primary occupation.

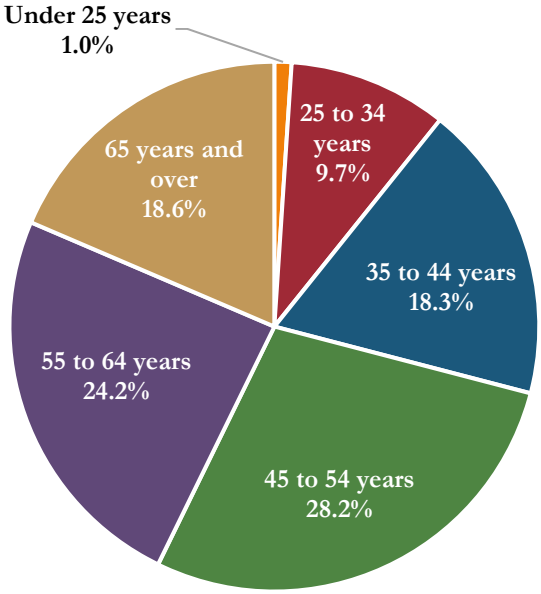
Exhibit 2.3.1 – Principal Operator Characteristics of Missouri Dairy Cattle and Milk Production Farms by NAICS Classification System (Code 11212), 2012

	Number	Percent
Race		
American Indian or Alaska Native	3	0.3%
Asian	--	0.0%
Black or African American	--	0.0%
Native Hawaiian or other Pacific Islander	--	0.0%
White	1,145	99.3%
Operators reporting more than one race	5	0.4%
Gender		
Male	1,066	92.5%
Women	87	7.5%
Ethnicity		
Spanish, Hispanic or Latino origin	8	0.7%
Primary Occupation		
Farming	916	79.4%
Other	237	20.6%
Total	**1,153**	

Source: USDA, National Agricultural Statistics Service, Census of Agriculture

Based on 2012 data from the U.S. Census of Agriculture, 42.8 percent of Missouri dairy cattle and milk production farm principal operators were at least 55 years old. See Exhibit 2.3.2. The 45- to 54-year-old segment represented 28.2 percent of all principal operators. Just 29 percent of the principal operators were younger than 45. These data indicate that Missouri dairy farm principal operators tend to be an older group. In the future, secession may become increasingly important to address.

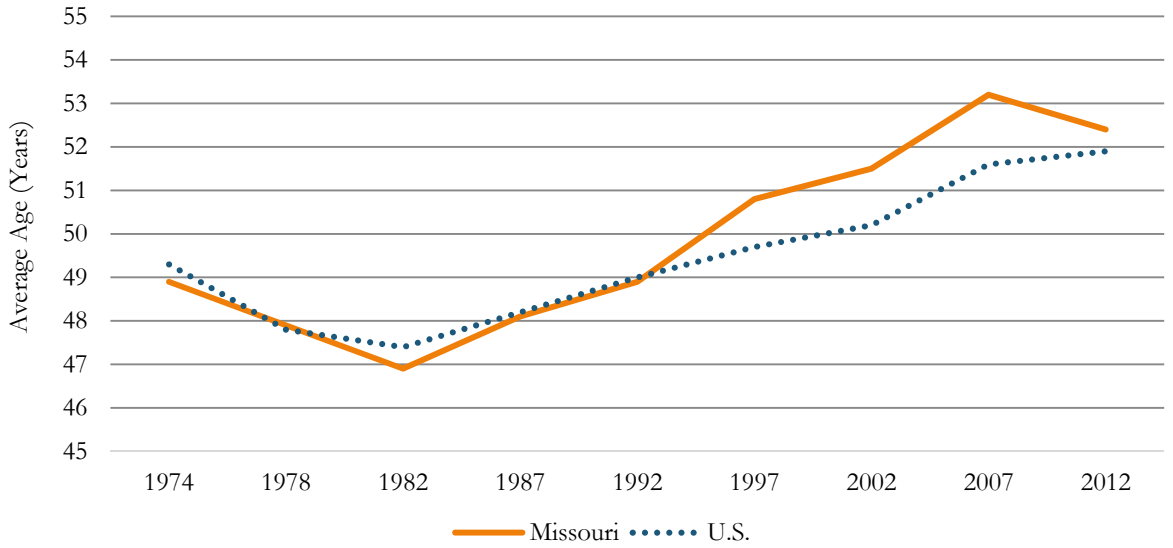
Exhibit 2.3.2 – Age Distribution of Missouri Dairy Cattle and Milk Production Farm Principal Operators by NAICS Classification System (Code 11212), 2012



Source: USDA, National Agricultural Statistics Service, Census of Agriculture

Over time, the average age of Missouri and U.S. dairy cattle and milk production farm operators has increased. Until the late 1990s, Missouri and U.S. dairy cattle and milk production farm operators tended to have similar average ages. Exhibit 2.3.3 illustrates the trend in operator average age since 1974. In the late 1990s, however, the Missouri and U.S. operator average ages slightly increased their variance. Based on USDA Census of Agriculture data, the Missouri average operator age increased to be one year to 1.5 years older than the U.S. average. This difference in average age narrowed in the most recent census when the average Missouri dairy cattle and milk production farm operator was 52.4 years old, and the U.S. average was 51.9 years old.

Exhibit 2.3.3 – Trend in Missouri and U.S. Average Age of Dairy Cattle and Milk Production Farm Operators (NAICS Code 11212)



Source: USDA, National Agricultural Statistics Service, Census of Agriculture

During 2012, 52.6 percent of Missouri dairy farms had Internet access. By comparison, 62 percent of all Missouri farms indicated having Internet access during 2013, based on a USDA National Agricultural Statistics Service report, and the U.S. Census Bureau reported that 74.8 percent of U.S. households had home Internet access during 2012. Thus, Missouri dairy farms tend to lag all U.S. households and all Missouri farms in connecting to the Internet. Exhibit 2.3.4 shares details about Missouri dairy cattle and milk production farms' access to the Internet. To connect to the Internet, DSL and satellite were the most popular service options that Missouri dairy cattle and milk production farms used in 2012. Mobile broadband and dial-up service were also relatively popular Internet access options for Missouri dairy farms.

Exhibit 2.3.4 – Internet Access of Missouri Dairy Cattle and Milk Production Farms by NAICS Classification System (Code 11212), 2012

Category	Total	% of All Dairy Farms
Internet Access	607	52.6%
Dial-up service	85	7.4%
DSL service	274	23.8%
Cable modem service	41	3.6%
Fiber-optic service	16	1.4%
Mobile broadband (computer or cell phone)	105	9.1%
Satellite service	145	12.6%
Broadband over power lines (BPL)	6	0.5%
Other Internet service	24	2.1%

Source: USDA, National Agricultural Statistics Service, Census of Agriculture

2.4 Dairy Farm Business Structure

Most Missouri farms categorized in the dairy cattle and milk production industry have organized as family or individual farms. Such family or individual farms represented 85.3 percent of all Missouri dairy cattle and milk production farms in 2012. See Exhibit 2.4.1. Other Missouri dairies have more formally organized as partnerships, 9.1 percent; corporations, 3.3 percent; and other structures, which include cooperatives, estates or trusts, institutions or other entities, 2.3 percent.

Exhibit 2.4.1 – Legal Status of Missouri Dairy Cattle and Milk Production Farms by NAICS Classification System (11212), 2012

	Farms	
	Number	**Percent**
Family or individual	984	85.3%
Partnership	105	9.1%
Registered under state law	60	5.2%
Corporation	38	3.3%
Family held	36	3.1%
10 or fewer stockholders	35	3.0%
More than 10 stockholders	1	0.1%
Other than family held	2	0.2%
10 or fewer stockholders	2	0.2%
Other	26	2.3%
Total	**1,153**	100%

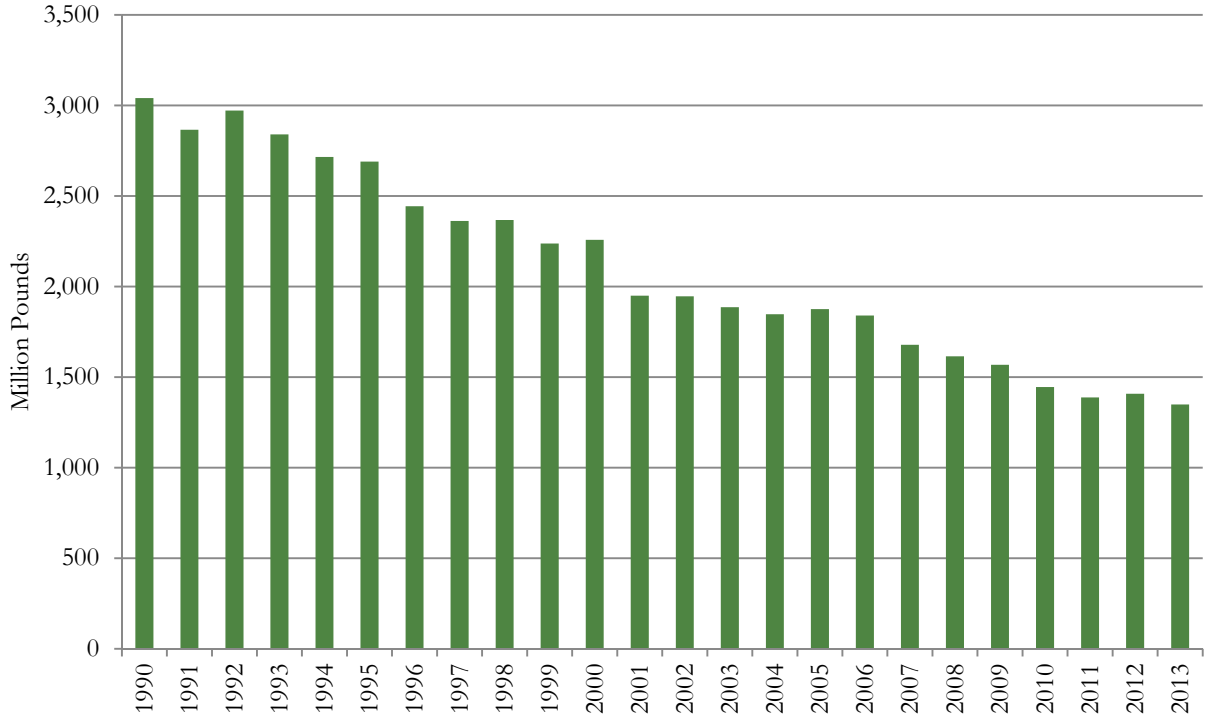
Source: USDA, National Agricultural Statistics Service, Census of Agriculture

3. Milk Production

3.1 Total Milk Production

Since 1990, Missouri milk production has trended downward. Exhibit 3.1.1 illustrates this milk production decline. Between 1990 and 2013, total Missouri milk production decreased by 55.6 percent, and milk yield per cow increased just 7.6 percent, compared with the national average of a 36.2 percent increase in milk production. A shrinking Missouri dairy herd and stagnant milk yield per cow are two factors contributing to the state's milk production decline. Lack of milk yield improvements may be attributed to pasture-based dairies gaining popularity in Missouri. Pasture-based dairies operate at lower milk production levels and contribute to lower milk yield per cow.

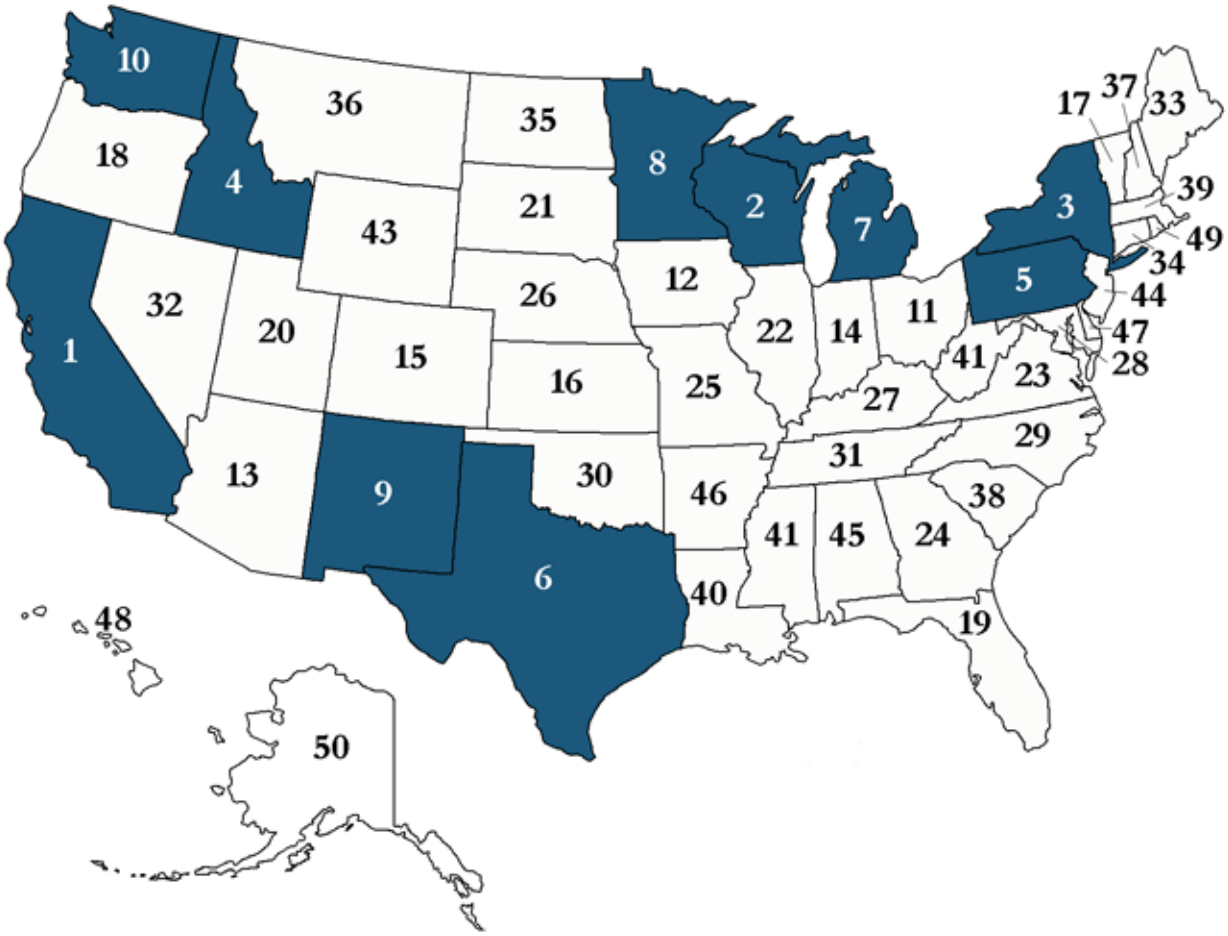
Exhibit 3.1.1 – Missouri Milk Production, 1990 to 2013



Source: USDA, National Agricultural Statistics Service

Relative to other states, Missouri ranked 25th for its milk production output during 2013. Exhibit 3.1.2 graphically depicts milk production rankings for all states, and it highlights states that rank in the top 10. States in the West, Southwest, Great Lakes and mid-Atlantic regions were represented for ranking in the top 10 for 2013 milk production. The three states that produced the most milk during 2013 were California, Wisconsin and New York.

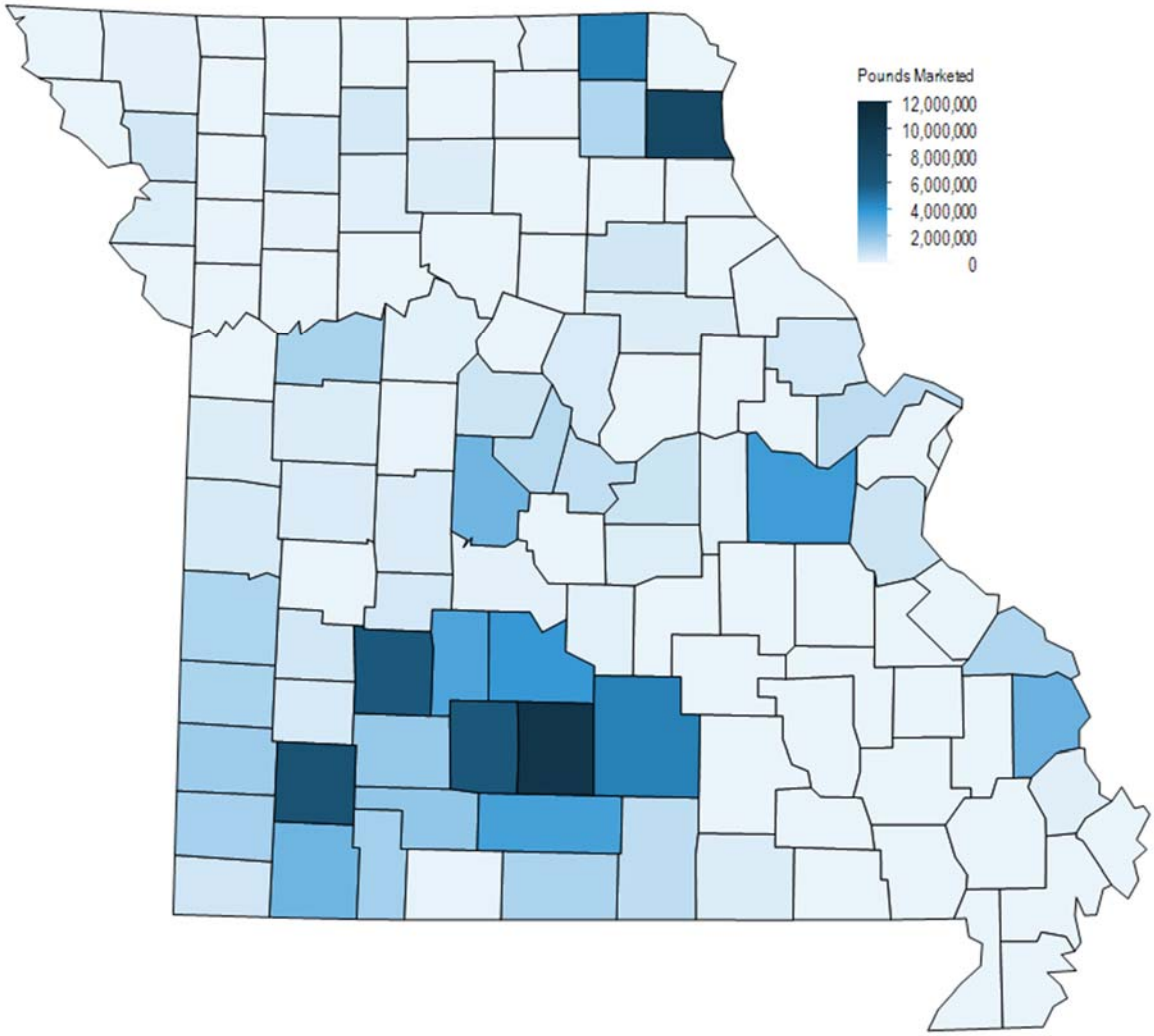
Exhibit 3.1.2 – Total Milk Production, 2013, Rankings by State and Top 10 States Highlighted



Source: USDA, National Agricultural Statistics Service

In Missouri, counties recognized for producing and marketing the greatest milk volumes in the federal order system tend to concentrate in the state's south central, southwest and northeast regions. Additionally, counties that neighbor the Missouri River to the south and Mississippi River also had more significant milk marketing volumes during December 2012 than counties in many other Missouri geographies. Exhibit 3.1.3 illustrates December 2012 federal order milk marketing volume data by county. Note that the data in Exhibit 3.1.3 represent milk marketed during December 2012. Because many seasonal pasture-based dairy operations dry off their herds in December, their production levels tend to be minimal in December compared with other months.

Exhibit 3.1.3 – Missouri Federal Order Milk Marketings, December 2012

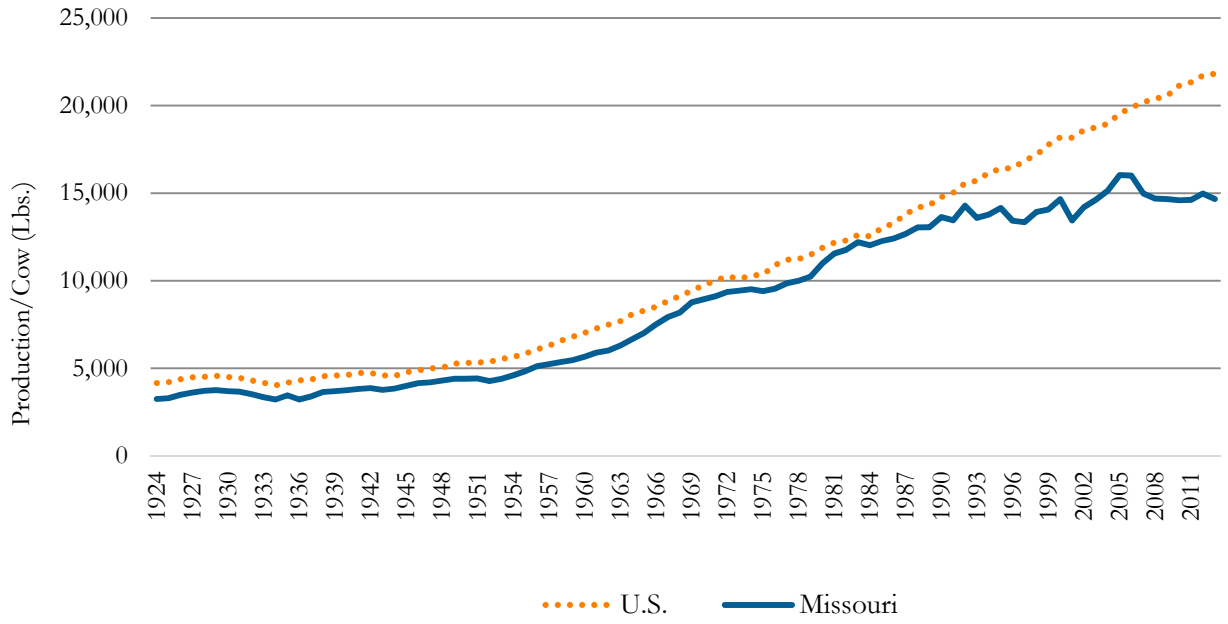


Source: Central Milk Market Administrator's Office

3.2 Milk Production per Cow

Since the 1920s, Missouri dairy cows have lagged U.S. dairy cows in average milk yield per cow. Exhibit 3.2.1 charts average milk yield per cow for Missouri and U.S. dairy cows. The graph indicates that the average U.S. dairy cow has consistently outperformed the average Missouri dairy cow based on milk yield per cow. Another trend noted in the milk yield data involves the recent widening deviation between the average U.S. and Missouri milk yield per cow. Since the 1990s, U.S. average milk yield per cow has continued a consistent growth trend. Growth in the average milk yield for Missouri cows began to slow during the 1990s and hasn't kept pace with the upward trend in average U.S. milk yield per cow. A common explanation for this Missouri deviation is the state's reliance upon pasture-based dairy systems rather than confinement systems. As national average milk production per cow surpassed 15,000 pounds in the early 1990s Missouri's lack of adoption of confinement systems restricted heat abatement and cow comfort technologies that enable higher milk production per cow.

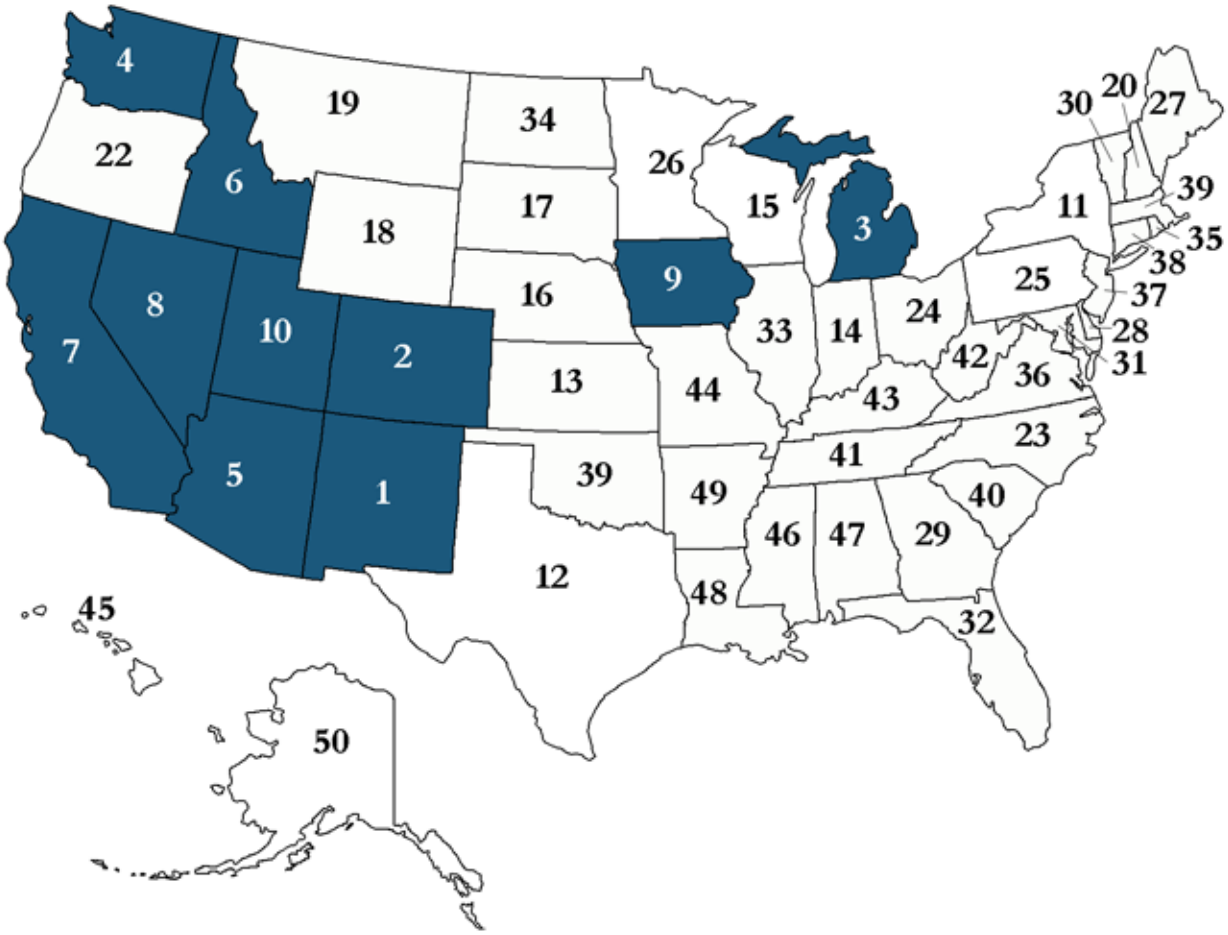
Exhibit 3.2.1 – U.S. and Missouri Milk Yield per Cow Trends, 1924 to 2013



Source: USDA, National Agricultural Statistics Service

Western states predominantly perform best from a milk production per cow perspective. Exhibit 3.2.2 depicts each state's rank in milk production per cow during 2013, and it highlights states ranked in the top 10. Although western states tend to rank higher for milk production per cow, Oregon notably lagged its neighboring states and ranked No. 22 during 2013. Two non-western states, Michigan and Iowa, were top-10 states for milk per cow during 2013. Compared with milk yield in other states, Missouri ranked 44th for milk production per cow. Since 2005, Missouri's large-scale adoption of low-input intensive rotational grazing dairying has decreased the state's average milk production per cow. Of its neighboring states, only Arkansas averaged lower milk output per cow than Missouri.

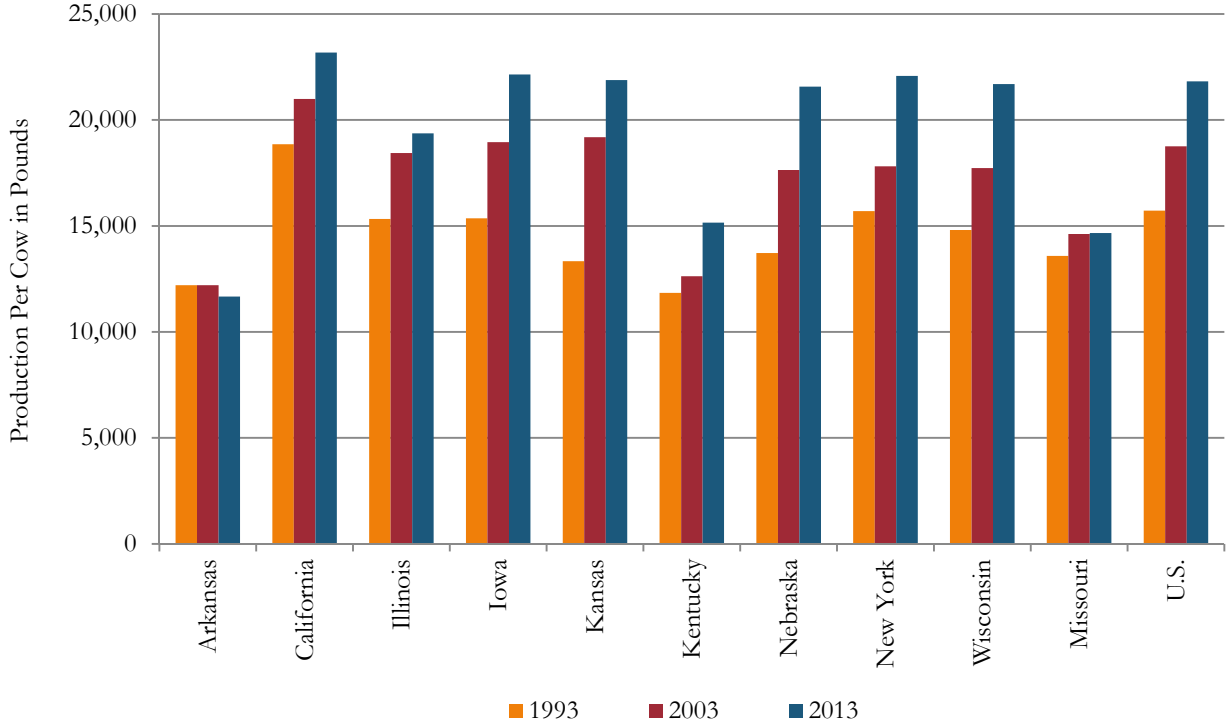
Exhibit 3.2.2 – Milk Production per Cow, 2013, Rankings by State and Top Ten States Highlighted



Source: USDA, National Agricultural Statistics Service

In 2013, U.S. milk production per cow averaged 21,822 pounds, which was 148.8 percent of Missouri's average of 14,663 pounds per cow. Exhibit 3.2.3 shows milk production per cow for the U.S., Missouri and selected states in 1993, 2003 and 2013. Between 1993 and 2013, milk production per cow accelerated in several states. Of the states shared in Exhibit 3.2.3, those with the greatest production output advances were Kansas, 64.1 percent; Nebraska, 57.2 percent; Wisconsin, 46.5 percent; and Iowa, 44.2 percent. By comparison, milk production per cow improvement has been less significant in Missouri. It gained just 7.9 percent between 1993 and 2013. Average U.S. milk production per cow increased 38.8 percent during the same period.

Exhibit 3.2.3 – Trends in Milk Yield per Cow for Selected States in 1993, 2003 and 2013

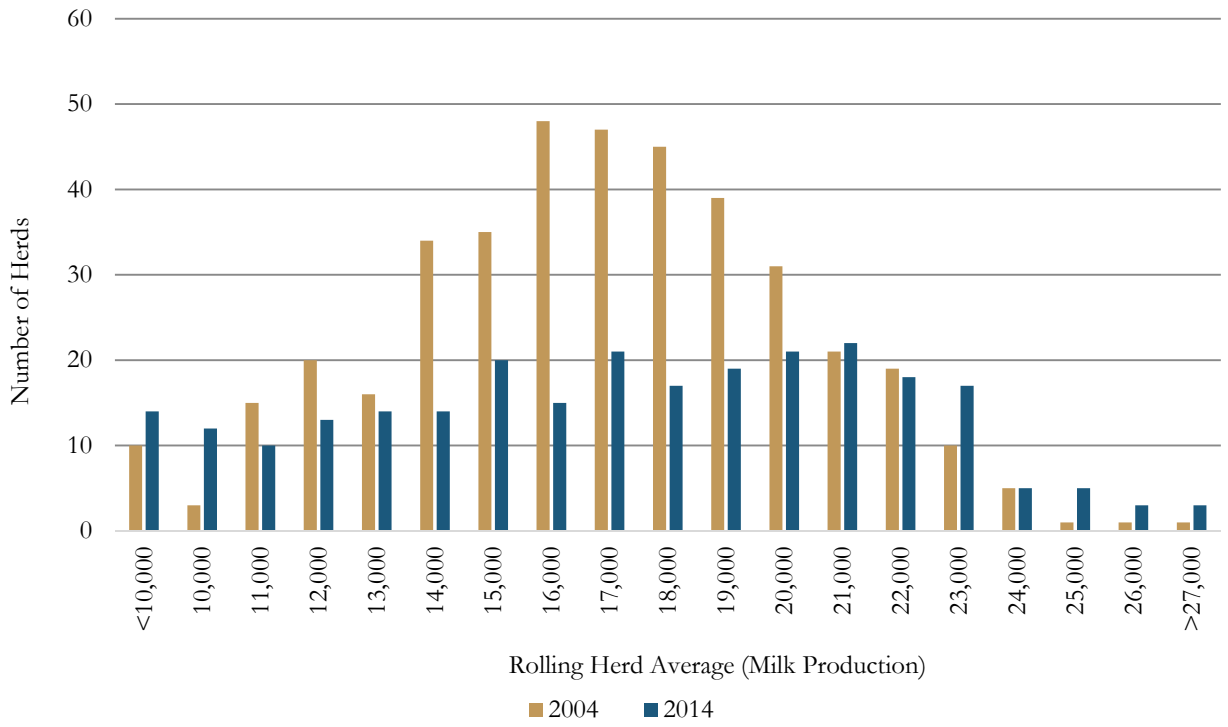


Source: USDA, National Agricultural Statistics Service

3.3 Rolling Herd Averages

Rolling herd averages estimate average milk production for an average Missouri milk cow during a particular year. Comparing the 2004 and 2014 rolling averages in Exhibit 3.3.1 communicates the extent to which average Missouri milk output per cow has changed during the past decade. These rolling average data suggest that Missouri dairy farmers have improved milk production per cow during the past decade. The dynamics have been interesting, though. For those Missouri dairy farms with DHIA records, more farms produced at the lowest and highest milk yield levels in 2014 than in 2004. In 2004, 2.5 percent of the Missouri rolling herd averages didn't reach 10,000 pounds, and in 2014, 5.3 percent of Missouri farm rolling herd averages failed to reach the 10,000-pound threshold. During 2004, just 0.2 percent of farms had rolling herd averages that exceeded 27,000 pounds, but that share increased to 1.1 percent in 2014.

Exhibit 3.3.1 – Missouri Rolling Herd Averages, 2004 and October 2014



Source: Dairy Herd Information Association (DHIA), Dairy Records Management Systems (DRMS)

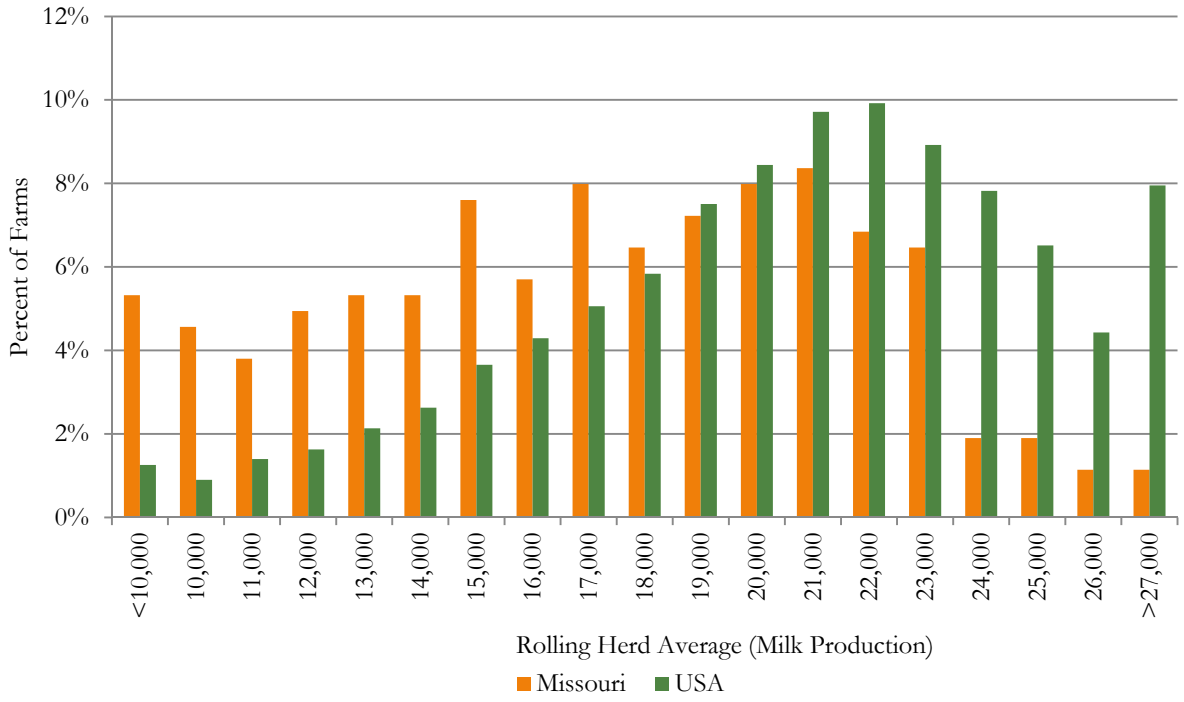
Within the mid-rolling average ranges, Missouri dairy farms have improved their averages. During 2004, 54.4 percent of Missouri rolling herd averages ranged from 10,000 pounds to 17,000, and that share decreased to 45.2 percent in 2014. Consequently, in the 18,000- to 26,000-pound range, 42.9 percent of Missouri rolling herd averages fit in this category during 2004, and that share increased to 48.3 percent of farms during 2014.

Expressed by an industry observer, one possible explanation of the Exhibit 3.3.1 trend is that Missouri has experienced an industry dividing into two dairy models. During the past decade, the number of minimalist grazing dairy producers with rolling herd averages below 14,000 pounds grew. Meanwhile,

a number of the state's higher producing confinement herds progressed beyond 20,000-pound rolling herd averages. Between those two production levels, as many as half of the DHIA herds disappeared due to producers retiring or leaving the industry.

During 2014, Missouri rolling herd averages tended to be lower than the U.S. average. Exhibit 3.3.2 displays the percent of Missouri and U.S. dairy farms by various rolling herd average categories in October 2014. At rolling averages less than 19,000 pounds, Missouri had a greater share of its farms reporting such averages at each 1,000-pound increment. At rolling averages that exceed 19,000 pounds, the U.S. had a greater share of its farms qualifying for these higher rolling herd average categories.

Exhibit 3.3.2 – Missouri and U.S. Rolling Herd Averages, October 2014



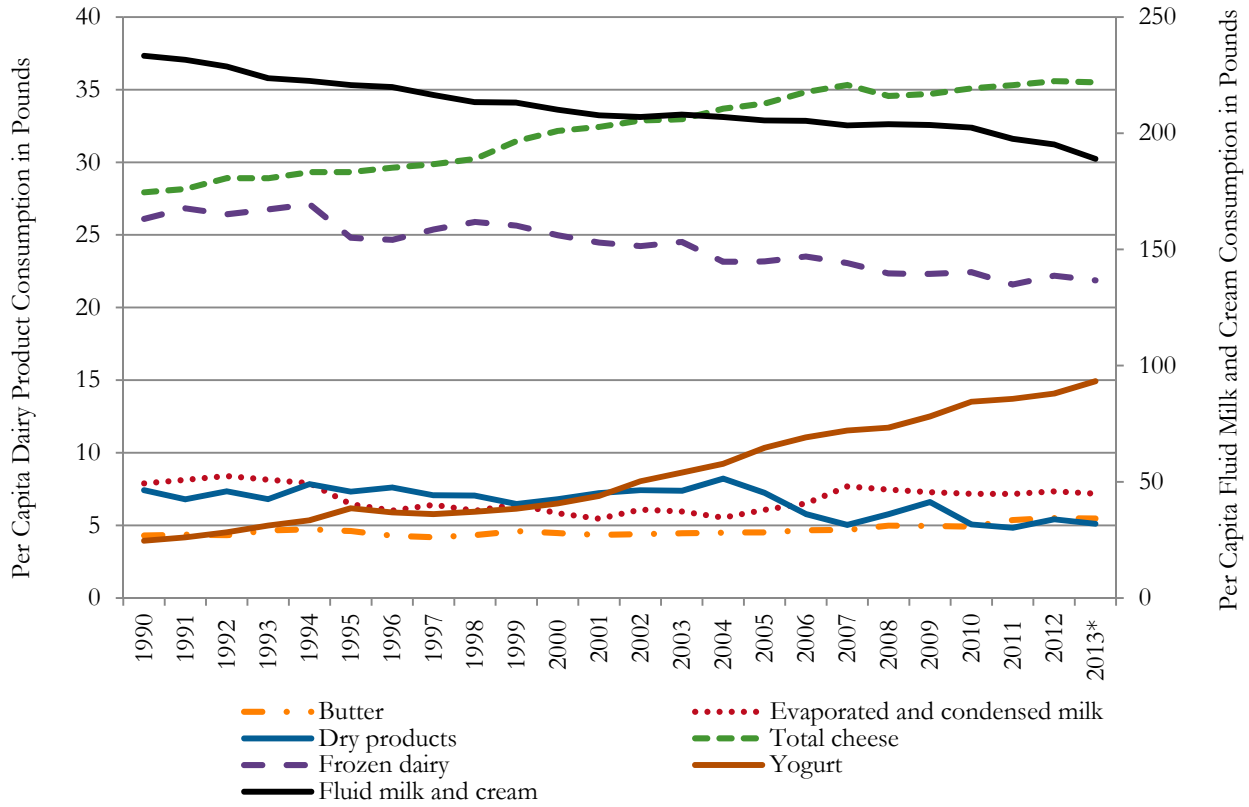
Source: Dairy Herd Information Association (DHIA), Dairy Records Management Systems (DRMS)

3.4 Per Capita Milk Production and Consumption

The national per capita consumption rate for fluid milk and cream averaged 189 pounds in 2013, based on preliminary data. To satisfy a state's fluid milk consumption needs, dairies in a given state must have produced at least 189 pounds of milk per person or imported milk from outside the state. On a milk equivalent and milk fat basis, per capita consumption of all dairy products in the U.S. averaged 607 pounds during 2013. This indicates that any state that produced less than 607 pounds of milk per person must have imported milk or processed dairy products to satisfy consumer dairy needs in the given state.

Between 1990 and 2013, U.S. consumer demand for milk in all dairy products increased 6.8 percent. Exhibit 3.4.1 displays the consumption trend for various dairy products. Note that fluid milk and cream and frozen dairy consumption both clearly trended downward. Between 1990 and 2013, fluid milk and cream consumption decreased by 19 percent, and frozen dairy consumption dropped by 16.2 percent. During this same period, yogurt, cheese and butter gained popularity. In terms of percentage growth, yogurt led all products as consumption expanded by nearly 279 percent. The average American consumed just 3.9 pounds in 1990, but consumption grew to 14.9 pounds in 2013. Growth in the butter and cheese categories was more conservative. Between 1990 and 2013, consumption in these categories both grew 27.1 percent.

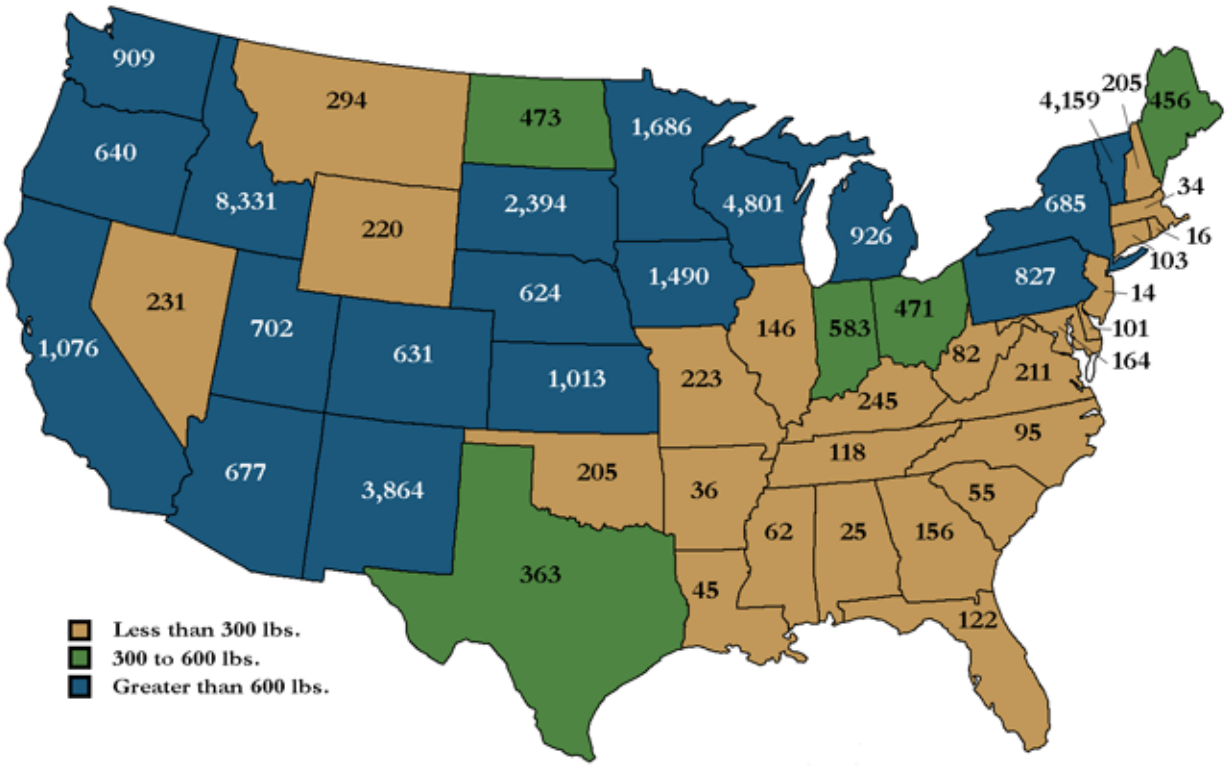
Exhibit 3.4.1 – U.S. per Capita Dairy Product Consumption Trends, Pounds



* 2013 data are preliminary.
Source: USDA, Economic Research Service

Missouri produced 223 pounds of milk per capita in 2013. Exhibit 3.4.2 shares milk production per capita data for all U.S. states. Values tend to be lowest in the southeast U.S. From 2008 to 2013, Missouri per capita milk production decreased by 18 percent. In 2013, Missouri's milk production would have supported 36.7 percent of the per capita consumption needs assumed for Missourians.

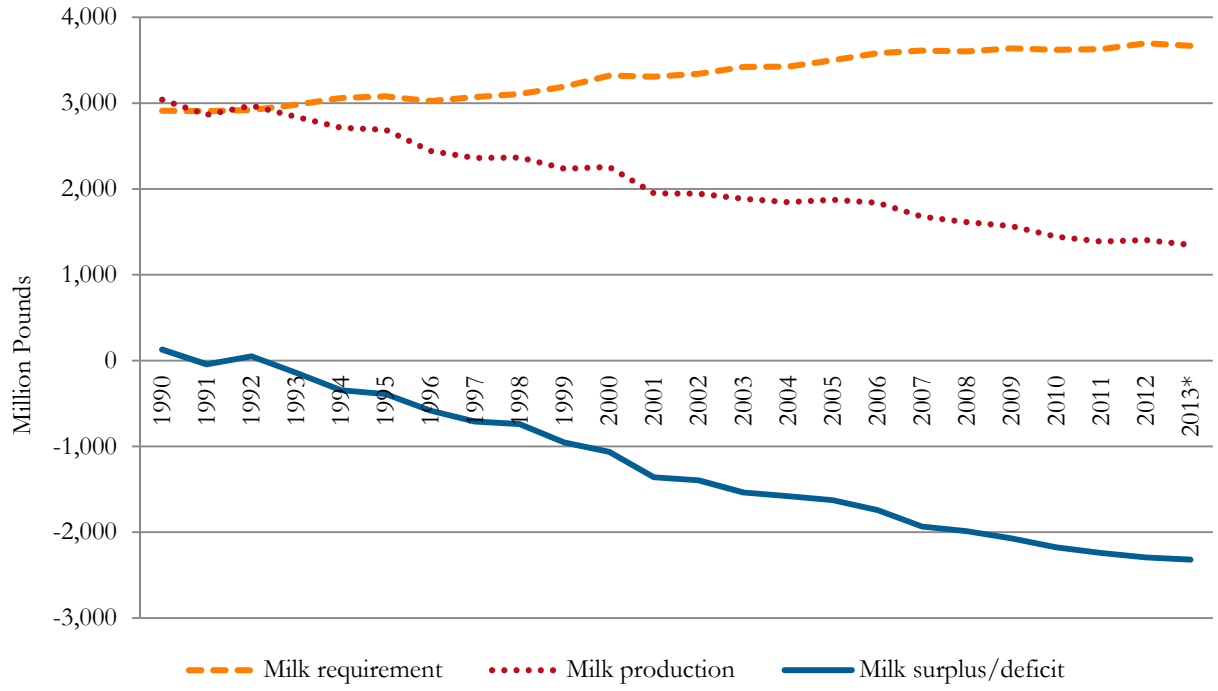
Exhibit 3.4.2 – Per Capita Milk Production by State, 2013



Source: Federal Milk Market Administrator, Central Order

Because milk production lags consumer needs, Missouri is considered a milk-deficit state. Exhibit 3.4.3 quantifies the milk deficit from 1990 to 2013; the 2013 milk deficient was approximated using preliminary per capita consumption data. The milk deficit value considers the state's milk production and the state's consumer milk needs for all dairy products on a milk-equivalent basis. Only twice since 1990 has Missouri recorded a milk surplus, and there was never a milk surplus since 1993. Recently, the state has consistently increased its milk deficit each year as production has declined and consumption needs have risen. In 2013, Missouri's estimated milk deficit exceeded 2.3 billion pounds.

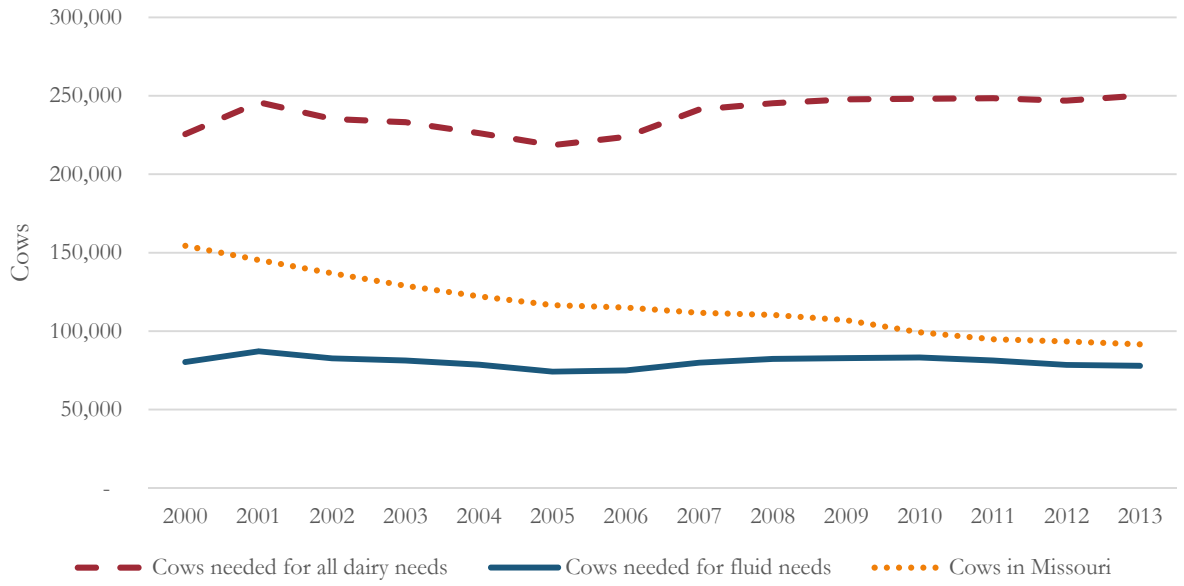
Exhibit 3.4.3 – Trend in Missouri Milk Surplus or Deficit, 1990 to 2013



* 2013 milk requirement and milk deficit based on preliminary per capita consumption data
Sources: U.S. Census Bureau and USDA, National Agricultural Statistics Service

Exhibit 3.4.4 illustrates the difference between milk needs and milk supply on a cow basis. The orange line illustrates the recorded change in Missouri milk cow inventory from 2000 to 2013. The blue line estimates the milk cow inventory (based on Missouri's average milk production per cow) needed to satisfy fluid milk needs in the state during each respective year. Based on these assumptions, Missouri milk cow inventory was adequate to serve the state's fluid milk needs between 2000 and 2013, but note that the gap between actual Missouri milk cow inventory and cows needed to satisfy fluid milk consumption has narrowed over time. The red line indicates that Missouri has needed about 250,000 milk cows in each of the past five years to produce enough milk to meet milk demand for all dairy needs. Considering that Missouri's actual milk cow inventory has recorded levels lower than 100,000 for the past three years, the state hasn't been close to maintaining enough cows to meet milk needs for all dairy products.

Exhibit 3.4.4 –Missouri's Evolution toward a Fluid-Only Milk Market, 2000 to 2013



Sources: Derived from U.S. Census Bureau and USDA, National Agricultural Statistics Service

4. Marketing and Prices

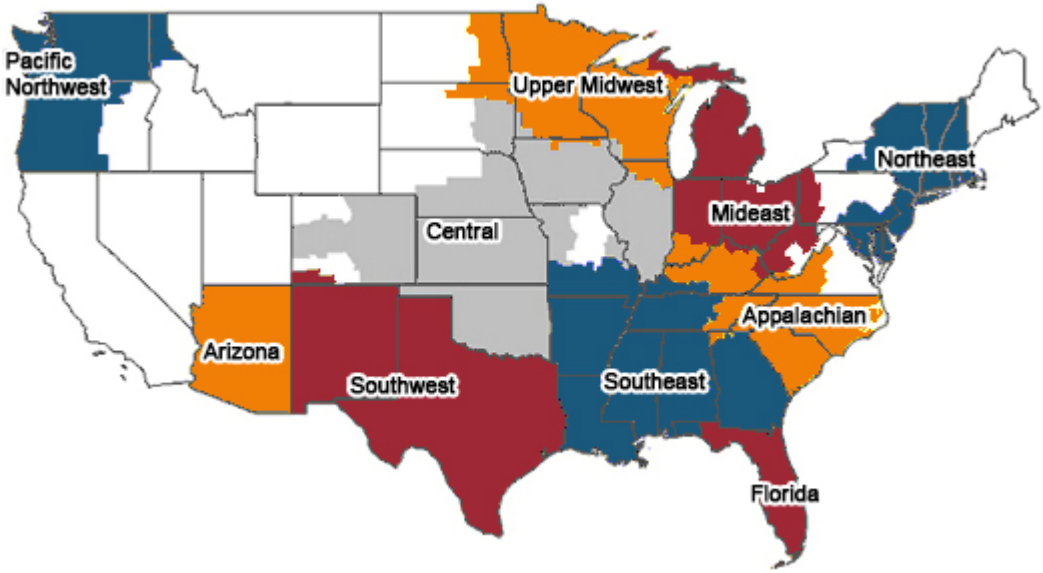
4.1 Milk Prices

Federal milk marketing orders set minimum prices for more than 60 percent of the Grade A milk produced in the U.S., and Grade A milk constitutes 99 percent of all U.S. milk produced. California uses a state pricing system similar to federal order pricing. The revised Agricultural Marketing Agreement Act of 1937 authorizes federal orders. USDA cites a few major benefits of the federal milk orders program:

1) It provides consumers with an adequate milk supply to meet needs throughout the year and helps to prevent extreme price fluctuations during heavy and light milk production periods.
2) It ensures a reasonable minimum milk price for dairy producers throughout the year.

Exhibit 4.1.1 highlights federal milk marketing order coverage areas.

Exhibit 4.1.1 – Federal Milk Marketing Order Areas



Source: USDA, Agricultural Marketing Service

The Southeast Order, which includes portions of southern Missouri, has a high Class I (fluid milk) utilization. The utilization rate averaged around 74 percent in 2014. As a comparison, the Central Order in northern Missouri had a Class I utilization rate that averaged 32 percent. Because Class I is the highest valued milk over time, orders with higher Class I utilization tend to have higher blend prices. Missouri is an increasingly milk-deficient area. Other states to the south and east of Missouri have experienced a similar phenomenon. It is expected that milk prices in this region will show relative increases compared with prices in other parts of the country, particularly as energy prices increase and milk transportation costs make local milk more valuable.

The national federal order mailbox milk price is a good measure of regional differences in U.S. milk prices received. Mailbox milk prices reflect the net pay price received by dairy farmers for milk. This includes all payments received for milk sold and all costs associated with marketing milk, including hauling. Price is a weighted average for the reporting area and is reported at the average butterfat test. Mailbox price does not include any Milk Income Loss Contract (MILC) payments. Exhibit 4.1.2 presents mailbox milk prices for various U.S. states and regions in 2011, 2012 and 2013. The southeast region of the U.S. tends to have higher milk prices received due to its high fluid milk demands and short supply. During the three years observed, the milk price in all federal order areas averaged $19.63 per hundredweight.

Exhibit 4.1.2 – Mailbox Milk Prices for Selected Reported Areas in Federal Orders and California

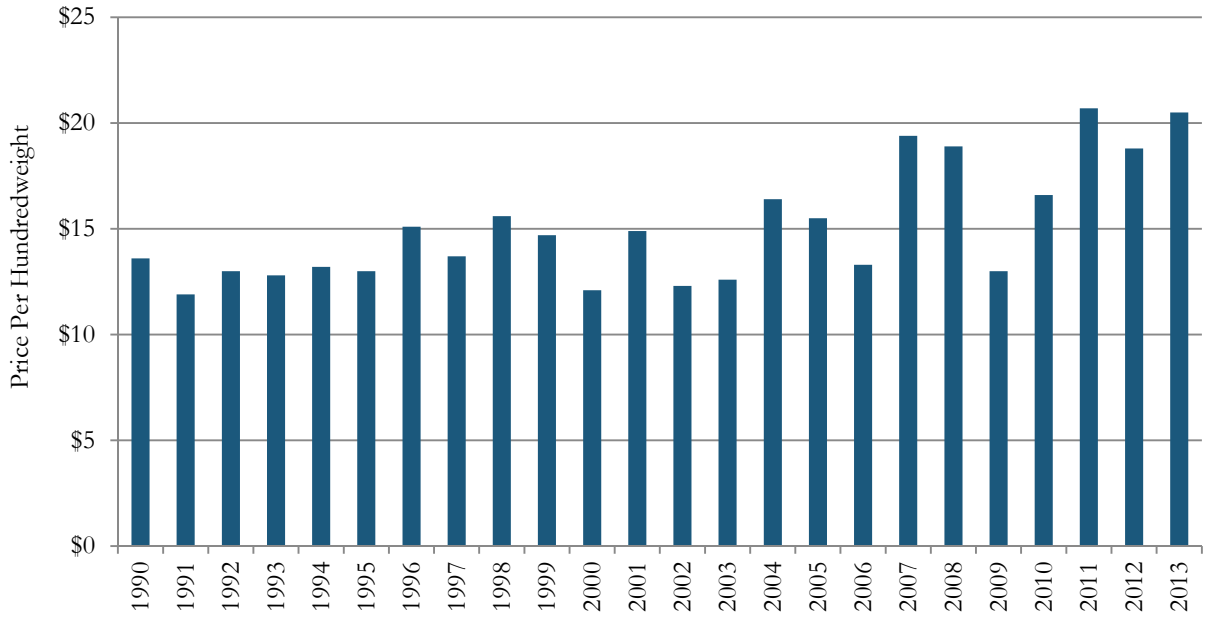
Reporting Area 1/	2011	2012	2013	Three-Year Simple Average
	Mailbox Milk Price Per Hundredweight 2/			
New England States 3/	$21.35	$19.63	$21.51	$20.83
New York	$20.00	$18.57	$20.50	$19.69
Eastern Pennsylvania 4/	$20.86	$18.95	$20.60	$20.14
Appalachian States 5/	$21.65	$19.47	$21.23	$20.78
Southeast States 6/	$22.11	$20.04	$21.61	$21.25
Southern Missouri 7/	$20.14	$18.05	$20.31	$19.50
Florida	$23.32	$21.26	$23.02	$22.53
Western Pennsylvania 8/	$20.93	$18.88	$20.45	$20.09
Ohio	$20.85	$18.68	$20.53	$20.02
Indiana	$20.44	$18.06	$19.97	$19.49
Michigan	$20.11	$17.91	$19.76	$19.26
Wisconsin	$20.06	$19.16	$20.07	$19.76
Minnesota	$19.99	$19.20	$19.93	$19.71
Iowa	$20.26	$18.94	$20.35	$19.85
Illinois	$20.63	$19.08	$20.35	$20.02
Corn Belt States 9/	$19.83	$18.11	$19.28	$19.07
Western Texas 10/	$19.35	$17.60	$19.00	$18.65
New Mexico	$18.31	$16.67	$17.96	$17.65
Northwest States 11/	$19.86	$18.05	$19.75	$19.22
All Federal Order Areas 12/	$20.20	$18.63	$20.07	$19.63
California 13/	$18.14	$16.29	$18.26	$17.56

1/ Information is shown for those areas for which prices are reported for at least 75% of the milk marketed under Federal milk orders. The price shown is the weighted average of the prices reported for all orders that received milk from the area. As applicable, includes milk not-pooled due to disadvantageous intra-order price relationships. 2/ Net pay price received by dairy farmers for milk. Includes all payments received for milk sold and all costs associated with marketing the milk. Price is a weighted average for the reporting area and is reported at the average butterfat test. Mailbox price does not include any Milk Income Loss Contract (MILC) payments. Mailbox price does include, for the most part, the $0.05 per cwt. assessment under the Cooperatives Working Together (CWT) program. 3/ Includes Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont. 4/ All the counties to the east of those listed in 8/. 5/ Includes Kentucky, North Carolina, South Carolina, Tennessee and Virginia. 6/ Includes Alabama, Arkansas, Georgia, Louisiana and Mississippi. 7/ The counties of Vernon, Cedar, Polk, Dallas, Laclede, Texas, Dent, Crawford, Washington, St. Francois and Perry and all those to the south of these. 8/ The counties of Warren, Elk, Clearfield, Indiana, Westmoreland and Fayette, and all those to the west of these. 9/ Includes Kansas, Nebraska and the Missouri counties to the north of those listed in 7/. 10/ All counties to the west of Fanin, Hunt, Van Zandt, Henderson, Houston, Cherokee, Nacogdoches and Shelby. 11/ Includes Oregon and Washington. 12/ Weighted average of the information for all selected reporting areas in Federal milk orders. Previous year figures have not been revised for new reporting areas. 13/ California is not part of the Federal Order program. Calculated by California Department of Food and Agriculture Dairy Marketing Board, and published in "California Dairy Information Bulletin."

Source: USDA, Federal Milk Market Administrator, Upper Midwest Order

Since 1990, Missouri milk prices have experienced volatility, but the price has maintained an upward trend. Exhibit 4.1.3 tracks the change in the average price received for Missouri milk. The exhibit illustrates that milk prices tend to be cyclical, meaning that prices cycle every few years. From 2011 to 2013, the Missouri milk price received averaged $20 per hundredweight. The longer term average price received from 1990 to 2013 was $15.07 per hundredweight.

Exhibit 4.1.3 – Average Returns for Missouri Milk, 1990 to 2013

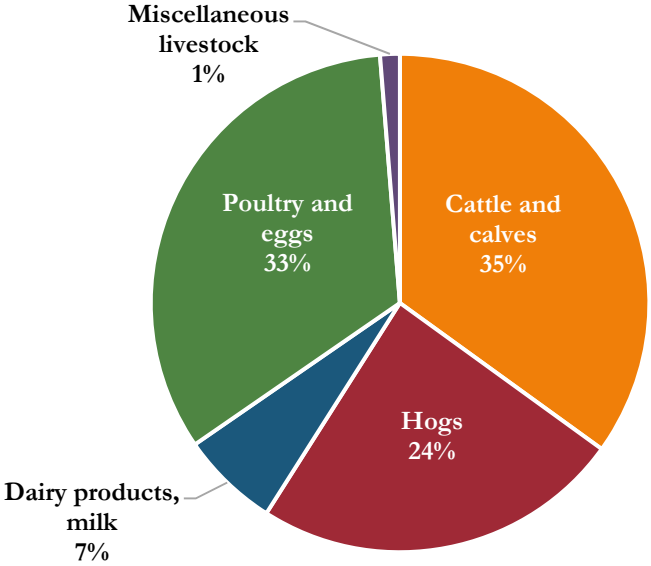


Source: USDA, National Agricultural Statistics Service

4.2 Farm Cash Receipts

The dairy industry is an important contributor to Missouri's economy. During 2013, the state's dairy industry generated $272.2 million in milk cash receipts. Of all Missouri livestock cash receipts in 2013, milk cash receipts represented 7 percent of the total. See Exhibit 4.2.1. Cattle and calves, poultry and eggs and hogs sales generated greater cash receipts totals than the milk production sector. Their shares were 35 percent, 33 percent and 24 percent, respectively.

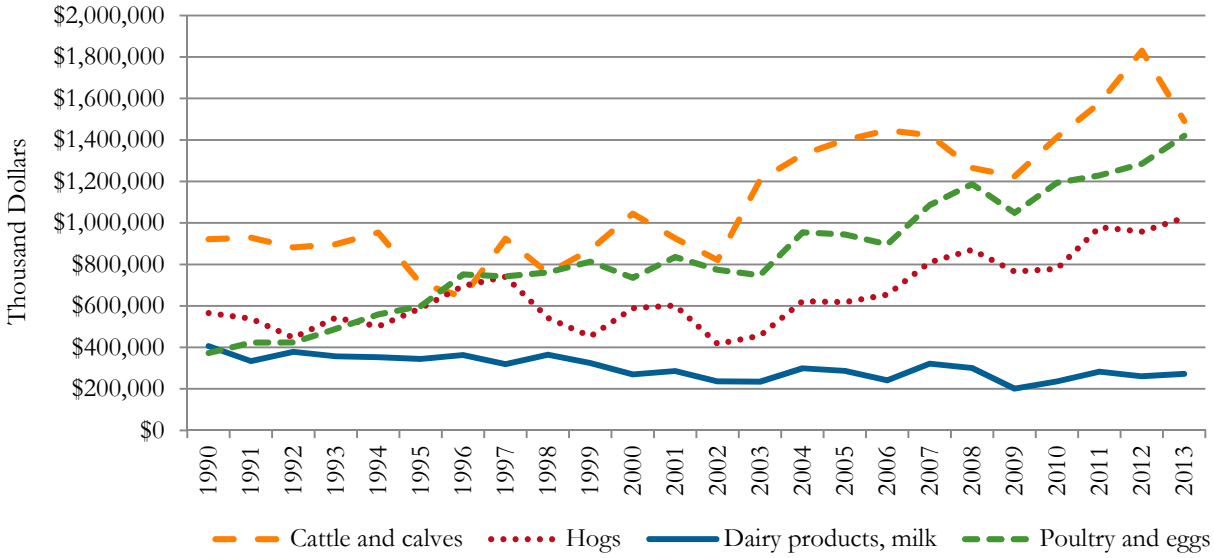
Exhibit 4.2.1 – Missouri Livestock Cash Receipts by Sector, 2013



Source: USDA, Economic Research Service

Missouri milk cash receipts have declined over time as dairy cows and farms maintained in the state have decreased. Exhibit 4.2.2 charts Missouri cash receipts for various livestock production sectors from 1990 to 2013. Missouri milk cash receipts decreased 32.9 percent between 1990 and 2013. Unlike the milk cash receipts values, receipts for cattle and calves, hogs and poultry and eggs have generally increased since 1990. Between 1990 and 2013, cash receipts for these categories grew by 61.8 percent for cattle and calves, 81.1 percent for hogs and 280.4 percent for poultry and eggs.

Exhibit 4.2.2 – Missouri Livestock Cash Receipts, 1990 to 2013



Source: USDA, Economic Research Service

4.3 Milk Use and Marketings

In 2013, Missouri produced 1.349 billion pounds of milk. Exhibit 4.3.1 shares the use distribution for that Missouri-produced milk. Missouri dairies market most of their milk. During 2013, producers marketed 98 percent of their total production. Milk marketed by producers represents milk sold to plants and dealers as whole milk and equivalent amounts of milk for cream. It also includes milk sold directly to consumers. Approximately 97 percent of all Missouri-produced milk was eligible for fluid use, meaning it was Grade A. The "fed to calves" and "used for milk, cream and butter" categories include milk that's used where it's produced. In 2013, Missouri dairies used a small share of total milk production for feeding calves and directing it toward on-farm milk, cream and butter consumption.

Exhibit 4.3.1 – Missouri Milk Use Distribution, 2013

Milk Use Category	Quantity of Milk (million pounds)
Milk marketed by producers	1,328
Fed to calves	17
Used for milk cream and butter	4
Total	**1,349**

Source: USDA, National Agricultural Statistics Service

During 2013, Missouri-produced milk contained 3.74 percent fat on average. Given that the state produced 1.349 billion pounds of milk that year, the state generated 50.5 million pounds of milk fat. Per cow, milk fat production totaled 548 pounds. By comparison, U.S. milk fat content averaged 3.76 percent, and the average U.S. dairy cow produced 821 pounds of milk fat in 2013. U.S. milk fat production exceeded 7.5 billion pounds during 2013.

5. Production Economics and Practices

5.1 Cost of Production

The USDA Economic Research Service estimates regional shifts in competitiveness by surveying producers and collecting costs and return information. Using 2010 data from the Agricultural Resource Management Survey as a base and other data, the agency prepared these estimates. Annually, USDA updates the estimates with new prices and production information. Exhibit 5.1.1 presents the 2013 results of these milk production cost estimates for various states and the U.S. Relative to the average for all states, Missouri producers incurred higher feed costs, total operating costs, allocated overhead costs and total costs. Missouri's small herd size contributed to its high opportunity cost of unpaid labor. Of the eight states evaluated, Missouri ranked second for the highest total costs. Only production costs in Kentucky were greater of the states observed in Exhibit 5.1.1. Missouri's total milk production costs were 36.6 percent higher than the all-state average total production cost. Per milk hundredweight sold, Missouri dairies incurred $10.03 more in production costs than the U.S. average. Of the states evaluated below, production costs were least expensive in Idaho and California.

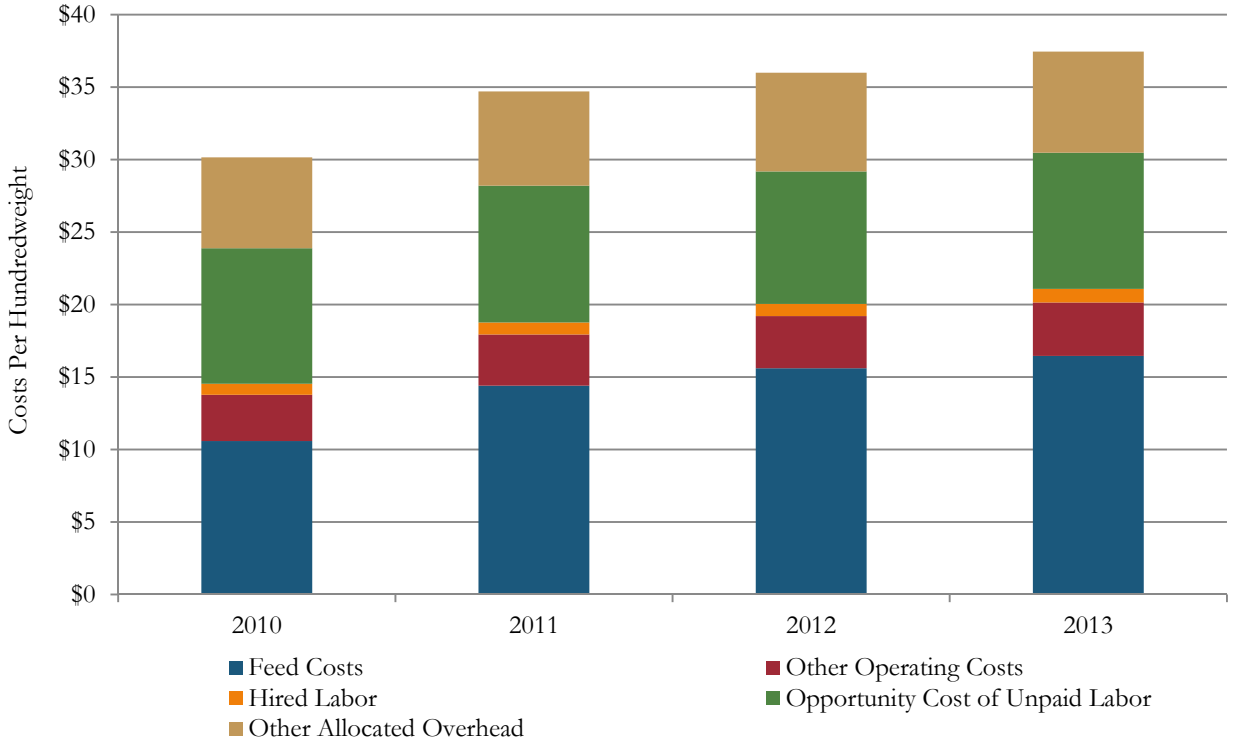
Exhibit 5.1.1 – Milk Cost of Production in Dollars per Hundredweight Sold, 2013

Item	CA	GA	ID	IA	KY	MO	TX	WI	All States
Operating costs:									
Feed--									
Purchased feed	11.15	9.21	8.59	8.58	8.41	10.27	11.57	6.19	9.48
Homegrown harvested feed	3.50	2.17	2.14	10.16	8.99	5.51	3.32	13.96	6.33
Grazed feed	0.03	0.28	0.03	0.13	0.45	0.68	0.29	0.11	0.10
Total, feed costs	14.68	11.66	10.76	18.87	17.85	16.46	15.18	20.26	15.91
Other--									
Veterinary and medicine	0.61	0.63	0.59	0.96	0.74	0.72	0.51	1.05	0.82
Bedding and litter	0.09	0.02	0.25	0.45	0.26	0.11	0.04	0.34	0.25
Marketing	0.30	0.21	0.28	0.16	0.33	0.16	0.13	0.23	0.24
Custom services	0.45	0.76	0.28	0.65	0.73	0.56	1.15	0.37	0.57
Fuel, lube, and electricity	0.67	1.03	0.52	1.03	1.34	1.30	0.83	1.02	0.82
Repairs	0.42	0.59	0.37	0.72	0.71	0.83	0.35	0.64	0.60
Other operating costs*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
Interest on operating capital	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Total feed and other operating costs	17.23	14.91	13.06	22.85	21.97	20.15	18.20	23.93	19.22
Allocated overhead:									
Hired labor	1.53	1.99	1.47	1.50	1.56	0.93	1.62	1.77	1.58
Opportunity cost of unpaid labor	0.42	3.82	0.32	2.90	7.74	9.40	2.29	3.18	2.22
Capital recovery of mach. and equip.	2.79	4.19	1.55	4.17	8.73	5.65	2.97	4.54	3.58
Opportunity cost of land (rental rate)	0.00	0.10	0.00	0.03	0.11	0.22	0.03	0.03	0.02
Taxes and insurance	0.14	0.18	0.08	0.24	0.28	0.47	0.16	0.27	0.19
General farm overhead	0.44	0.44	0.29	0.63	0.50	0.63	0.27	0.80	0.61
Total, allocated overhead	5.32	10.72	3.71	9.47	18.92	17.30	7.34	10.59	8.20
Total costs listed	**22.55**	**25.63**	**16.77**	**32.32**	**40.89**	**37.45**	**25.54**	**34.52**	**27.42**

* Costs for third-party organic certification.
Source: USDA, Economic Research Service

For 2010 to 2013, Exhibit 5.1.2 shares Missouri milk production costs, which include whole-herd feed costs. Total costs have grown gradually to total $37.45 per hundredweight in 2013. Between 2010 and 2013, total costs increased by 24.2 percent. Of the five cost categories, feed costs increased most. Feed expense grew 55.4 percent between 2010 and 2013. The other costs grew more gradually. Opportunity cost of unpaid labor grew the least during the observed period.

Exhibit 5.1.2 – Missouri Milk Cost of Production per Hundredweight Sold, 2010 to 2013



Source: USDA, Economic Research Service

5.2 Income over Feed Cost

From 2005 to 2013, feed costs to produce a hundredweight of milk in Missouri more than doubled, and this has pressured the milk income over feed cost indicator. Exhibit 5.2.1 quantifies the income per hundredweight of milk produced that remains after dairy producers account for the feed cost investment to produce the milk. This income over feed cost value has fluctuated from 2005 to 2013; however, the value trended downward during the observed period. It reached its highest level, $8.02 per hundredweight, during 2007 and its lowest level, $1.80 per hundredweight, during 2009. In 2013, income over feed cost for Missouri averaged $3.32 per hundredweight.

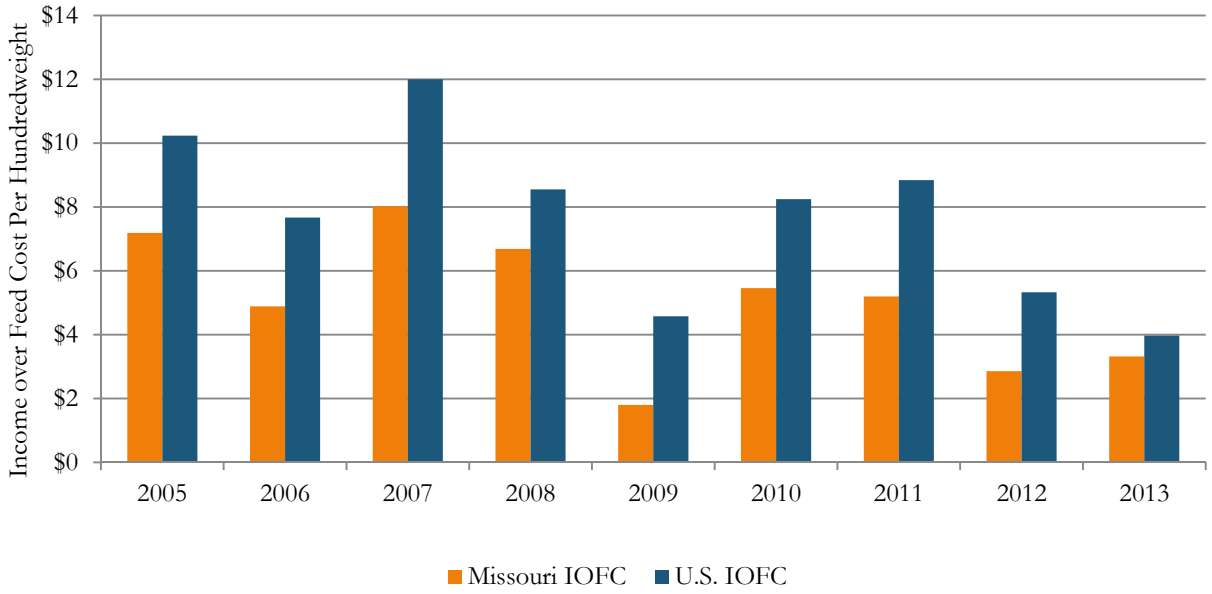
Exhibit 5.2.1 – Missouri Income over Feed Cost per Hundredweight Milk, 2005 to 2013

Item	2005	2006	2007	2008	2009	2010	2011	2012	2013
Missouri milk price ($/cwt.)	$14.59	$12.50	$18.19	$17.63	$11.65	$16.05	$19.61	$18.47	$19.78
Purchased feed	$5.13	$5.07	$6.52	$7.43	$6.97	$6.57	$9.53	$9.77	$10.27
Homegrown harvested feed	$1.98	$2.26	$3.44	$3.30	$2.68	$3.46	$4.28	$5.18	$5.51
Grazed feed	$0.29	$0.28	$0.21	$0.21	$0.20	$0.56	$0.60	$0.66	$0.68
Total feed $/cwt. milk	$7.40	$7.61	$10.17	$10.94	$9.85	$10.59	$14.51	$15.61	$16.46
Missouri income over feed cost/cwt. milk	**$7.19**	**$4.89**	**$8.02**	**$6.69**	**$1.80**	**$5.46**	**$5.20**	**$2.86**	**$3.32**

Source: USDA, Economic Research Service

Relative to the U.S. average, Missouri averaged a less desirable income over feed cost value from 2005 to 2013. Exhibit 5.2.2 shares income over feed cost values from 2005 to 2013 for Missouri and the U.S. In 2013, the Missouri income over feed cost value was just 83.6 percent of the U.S. value. Although the U.S. income over feed cost value tends to be higher than Missouri's value, note that the two values tend to move in similar directions from year to year.

Exhibit 5.2.2 – Missouri Income over Feed Cost per Hundredweight Milk, 2005 to 2013



Source: USDA, Economic Research Service

5.3 Farm Financial Statements and Analysis

The USDA Agricultural Resource Management Survey (ARMS) collects dairy farm structural and financial data for 15 states. States represented in the survey are Arkansas, California, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Minnesota, Missouri, Nebraska, North Carolina, Texas, Washington and Wisconsin. Exhibit 5.3.1 shares structural characteristic data captured in the 2012 ARMS report. Keep in mind that a major drought impacted Missouri during this year, so it has some influence on the financial data. Missouri dairy farms represented just 3.7 percent of the dairy farms represented in all surveyed states, 2.9 percent of acres operated by dairy farms in the surveyed states and 0.7 percent of dairy farm production value in the surveyed states.

Exhibit 5.3.1 – Dairy Farm Business Structural Characteristics, 2012

Category	Units	All Surveyed States	Missouri
Number of farms	Farms	47,569	1,750
Total value of production	1,000 dollars	39,862,837	278,673
Total acres operated	1,000 acres	19,835	572
Acres operated per farm	Acres	417	327
Farms by tenure: Full owner	Percent	30	67
Farms by tenure: Part owner	Percent	58	33
Farms by tenure: Tenant	Percent	12	0
Operator occupation: Farming	Percent	93	58
Operator occupation: Something else	Percent	2*	21*
Operator occupation: Retired	Percent	*	21*
Operator education: Less than high school	Percent	20	30
Operator education: Completed high school	Percent	47	46
Operator education: Some college	Percent	25	15*
Operator education: Completed 4 years college or more	Percent	*	*
Operator hours worked annually on farm: Less than 500	Percent	2*	2*
Operator hours worked annually on farm: 500 to 999	Percent	1	0
Operator hours worked annually on farm: 1,000 to 1,999	Percent	6*	33
Operator hours worked annually on farm: 2,000 or more	Percent	91	65

* The estimate is statistically unreliable due to the combination of a low sample size and high sampling error.
Source: USDA, Economic Research Service, Agricultural Resource Management Survey (ARMS)

Missouri dairy farm operator characteristics vary somewhat from those of all dairy farm operators in the selected states. Full-owners operate a majority (67 percent) of Missouri dairy farms. However, among dairy farms in all surveyed states, part-owners operate a majority (58 percent) of dairy farms. Operators in all surveyed states are more likely to identify farming as their occupation. Ninety-three percent of operators in all surveyed states noted farming as their occupation, but just 58 percent of Missouri dairy farm operators shared that farming was their occupation. Twenty-one percent of Missouri dairy farmers noted being retired, and 21 percent identified their occupation as something else. USDA noted that both of these estimates were statistically unreliable, however.

Likely a reflection of Missouri dairy operators splitting time between dairy farming and other occupations, a smaller share of Missouri dairy farmers identified annually working at least 2,000 hours on the farm than dairy operators in all surveyed states. Of the dairy operators in all surveyed states, 91

percent indicated working on the farm at least 2,000 hours per year. In Missouri, about two-thirds of dairy operators worked on the farm at least 2,000 hours per year.

Regarding operator education level, about half of the Missouri dairy operators and dairy operators in all surveyed states at least have a high school diploma. One-quarter of those in all surveyed states had completed some college, but just 15 percent of Missouri dairy operators had some college, though USDA reported that the Missouri estimate was statistically unreliable. Due to low statistical reliability, ARMS didn't report about dairy operators who had attended at least four years of college.

A dairy farm's income statement summarizes the farm's revenue, expenses and net income during a given year. Exhibit 5.3.2 presents the average dairy farm business income statement for Missouri dairy farms and all farms in the ARMS study states. From a revenue perspective, Missouri dairy farm gross cash income averaged just one-fifth the gross cash income collected by an average farm in all surveyed states. Livestock income was the primary income source. Among Missouri dairy farms, livestock income represented nearly 85 percent of total gross cash income. Non-livestock-related income sources included crop sales, government payments and other farm-related income.

Regarding dairy farm business expenses, variable expenses were more significant than fixed expenses during 2012 for Missouri dairy farm businesses. Among the variable costs, feed, labor and fertilizer and chemicals were the most significant. For dairy farm businesses in all surveyed states, the most significant variable expenses during 2012 were feed, labor, repairs and maintenance and other livestock-related costs. In Missouri, the largest fixed expense for dairy farm businesses during 2012 was interest, and for dairy farms in all surveyed states, the most significant fixed expense was rent and lease payments. During 2012, net cash income per farm averaged $194,940 for dairies in all surveyed states and $39,688 for those in Missouri. After accounting for depreciation, non-cash labor benefits, inventory changes and nonmoney income, net farm income for dairy businesses averaged $164,224 per farm for dairies in all surveyed states and $15,406 for Missouri dairy farm businesses.

Exhibit 5.3.2 – Dairy Farm Business Income Statement, 2012

Category	Units	All Surveyed States	% of Gross Cash Income	Missouri	% of Gross Cash Income
Farms	Number	47,569		1,750	
Gross cash income	Dollars per farm	866,736	100.0%	178,007	100.0%
Livestock income	Dollars per farm	795,422	91.8%	150,731	84.7%
Crop sales	Dollars per farm	30,032	3.5%	8,900*	5.0%
Government payments	Dollars per farm	11,827	1.4%	3,772	2.1%
Other farm-related income /1	Dollars per farm	29,455	3.4%	14,604*	8.2%
Total cash expenses	Dollars per farm	671,796	77.6%	138,320	77.7%
Variable expenses	Dollars per farm	615,497	71.0%	126,900	71.3%
Livestock purchases	Dollars per farm	1,215	0.1%	1,047*	0.6%
Feed	Dollars per farm	329,736	38.0%	67,941	38.2%
Other livestock-related /2	Dollars per farm	33,403	3.9%	3,935	2.2%
Seed and plants	Dollars per farm	14,833	1.7%	3,766	2.1%
Fertilizer and chemicals	Dollars per farm	28,434	3.3%	9,626	5.4%
Utilities	Dollars per farm	18,979	2.2%	3,546	2.0%
Labor	Dollars per farm	73,567	8.5%	12,112	6.8%
Fuels and oils	Dollars per farm	26,176	3.0%	7,805	4.4%
Repairs and maintenance	Dollars per farm	33,732	3.9%	7,866	4.4%
Machine-hire and custom work	Dollars per farm	31,656	3.7%	5,090	2.9%
Other variable expenses /3	Dollars per farm	23,767	2.7%	4,165	2.3%
Fixed expenses	Dollars per farm	56,299	6.5%	11,420	6.4%
Real estate and property taxes	Dollars per farm	7,907	0.9%	2,250	1.3%
Interest	Dollars per farm	18,307	2.1%	4,937	2.8%
Insurance premiums	Dollars per farm	10,060	1.2%	1,901	1.1%
Rent and lease payments	Dollars per farm	20,025	2.3%	2,332*	1.3%
Net cash farm income	Dollars per farm	194,940	22.5%	39,688	22.3%
Depreciation	Dollars per farm	52,480	6.1%	13,843	7.8%
Labor, non-cash benefits	Dollars per farm	1,482	0.2%	90*	0.1%
Value of inventory change	Dollars per farm	16,256	1.9%	*	-
Nonmoney income /4	Dollars per farm	8,614	1.0%	8,205	4.6%
Net farm income	Dollars per farm	164,224	18.9%	15,406*	8.7%

* - The estimate is statistically unreliable due to the combination of a low sample size and high sampling error.
1 - Includes income from machine-hire, custom work, livestock grazing, land rental, contract production fees, outdoor recreation and other farm-related sources.
2 - Includes livestock leasing, custom feed processing, bedding and grazing.
3 - Includes supplies, registration fees, transportation, storage and general business expenses.
4 - Defined as home consumption and imputed rental value of farm dwellings owned by the farm operation.
Source: USDA, Economic Research Service, Agricultural Resource Management Survey (ARMS)

A dairy farm's balance sheet provides a snapshot of the farm's assets, liabilities and equity on a given date. Exhibit 5.3.3 presents 2012 balance sheet data collected from dairy farm businesses in Missouri and all surveyed states represented in the ARMS data set. In 2012, Missouri dairy farm assets totaled more than $1.03 million per farm. Relative to Missouri dairy farms, dairies in all surveyed states held more assets, nearly $2.27 million per farm on average, during 2012. Assets may be classified as current, which are assets used with a one-year period, or noncurrent assets, which are long-term assets. Among Missouri dairy farms and those in all surveyed states, noncurrent assets represent a greater share of total assets, and land and buildings are the greatest noncurrent assets.

Exhibit 5.3.3 – Dairy Farm Business Balance Sheet, 2012

Category	Units	All Surveyed States	% of Farm Assets	Missouri	% of Farm Assets
Farms	Number	47,569		1,750	
Farm assets	Dollars per farm	2,269,085	100.0%	1,034,292	100.0%
Assets: Current	Dollars per farm	303,613	13.4%	76,240	7.4%
Assets: Livestock inventory	Dollars per farm	60,670	2.7%	11,794	1.1%
Assets: Crop inventory	Dollars per farm	114,717	5.1%	28,569*	2.8%
Assets: Purchased inputs	Dollars per farm	21,399	0.9%	3,215	0.3%
Assets: Cash invested in growing crops	Dollars per farm	3,904	0.2%	16*	0.0%
Assets: Prepaid insurance	Dollars per farm	2,515	0.1%	475	0.0%
Assets: Other /1	Dollars per farm	100,408	4.4%	32,172	3.1%
Assets: Non-current	Dollars per farm	1,965,472	86.6%	958,052	92.6%
Assets: Investment in cooperatives	Dollars per farm	19,989	0.9%	8,905*	0.9%
Assets: Land and buildings /2	Dollars per farm	1,386,908	61.1%	771,297	74.6%
Assets: Operators dwelling	Dollars per farm	105,845	4.7%	104,530	10.1%
Assets: Farm equipment	Dollars per farm	248,575	11.0%	104,704	10.1%
Assets: Breeding animals	Dollars per farm	310,001	13.7%	73,145	7.1%
Farm liabilities	Dollars per farm	382,529	16.9%	85,394	8.3%
Liabilities: Current	Dollars per farm	103,945	4.6%	15,559	1.5%
Liabilities: Notes payable within one year	Dollars per farm	48,832	2.2%	4,443	0.4%
Liabilities: Current portion of term debt	Dollars per farm	36,779	1.6%	7,128	0.7%
Liabilities: Accrued interest	Dollars per farm	10,926	0.5%	2,442	0.2%
Liabilities: Accounts payable	Dollars per farm	7,408	0.3%	1,545	0.2%
Liabilities: Noncurrent	Dollars per farm	278,585	12.3%	69,836	6.8%
Liabilities: Nonreal estate	Dollars per farm	57,027	2.5%	5,692	0.6%
Liabilities: Real estate	Dollars per farm	221,558	9.8%	64,144	6.2%
Farm equity	Dollars per farm	1,886,555	83.1%	948,898	91.7%

* - The estimate is statistically unreliable due to the combination of a low sample size and high sampling error.
1 - Includes accounts receivable, certificates of deposit, checking and saving balances, and any other financial assets of the farm business.
2 - The value of the operators' dwelling and any associated liabilities were included if the dwelling was owned by the farm business.
Source: USDA, Economic Research Service, Agricultural Resource Management Survey (ARMS)

Liabilities and equity finance a dairy farm's assets. For both Missouri dairy farms and those in all surveyed states, assets are more significantly financed with equity than liabilities. Like assets, liabilities are categorized as current liabilities, which are those paid within a one-year period, and noncurrent liabilities, which are held for longer terms than one year. For Missouri dairy farms in 2012, the largest current liabilities maintained on their balance sheets was the current portion of term debt. For dairy

farms in all surveyed states, the largest current liabilities were notes payable within one year. Real estate was the most significant noncurrent liability for dairy farm business in Missouri and all surveyed states.

Financial ratios summarize financial performance. Exhibit 5.3.4 shares several 2012 financial ratios for dairy farm businesses in Missouri and all surveyed states. The current ratio conveys whether a farm can pay current liabilities with current assets. Although the average current ratios for farms in Missouri and all surveyed states indicate that both could repay current liabilities, Missouri farms on average had a stronger current ratio. The debt-to-asset ratio indicates a farm's reliance on debt to finance its assets. The ratio is low for both groups – dairy farms in Missouri and those from all 15 surveyed states – but it's lowest for Missouri dairies. The term debt coverage ratio also suggests that both groups produce adequate net income to repay term debt principal and interest. The return on assets and return on equity values suggest that Missouri dairy farms are less efficient at using assets and equity to generate return, though both ratios were statistically reliable. The negative operating profit margin for Missouri dairy farm businesses in 2012 indicates that the average dairy struggled to efficiently earn a return from its sales. Note, however, that the value was statistically unreliable.

Exhibit 5.3.4 – Dairy Farm Business Financial Ratios, 2012

Category	Units	All Surveyed States	Missouri
Farms	Number	47,569	1,750
Current ratio	Ratio	2.9	4.9
Working capital-to-expense ratio	Percent	29.7	43.9
Debt/asset	Percent	16.9	8.3
Rate of return on assets	Percent	4*	-2.1*
Rate of return on equity	Percent	3.9*	-2.4*
Operating profit margin	Percent	10.9*	-21.3*
Term debt coverage ratio	Number of times	6.3	5.6*
Asset turnover ratio	Number of times	0.4	0.2
Operating expense ratio	Percent	77.5	77.7
Economic cost-to-output ratio	Percent	96.8	125.7

* - The estimate is statistically unreliable due to the combination of a low sample size and high sampling error.
Source: USDA, Economic Research Service, Agricultural Resource Management Survey (ARMS)

Based on a percent of all dairy farms, fewer Missouri dairy farms carried debt than dairy farms in all surveyed states in 2012, and of the farms reporting debt, those in Missouri indicated that they have less debt per farm than dairy businesses in all surveyed states. Exhibit 5.3.5 presents data about the capacity for dairies to repay their debt. On average, Missouri dairy farms reported less gross cash farm income, net farm income and income for debt coverage in 2012 than farms in all surveyed states. However, these lower income levels may not preclude them from repaying their debt because they also reported having less debt and less maximum feasible debt. On average, repayment capacity use indicators were higher for Missouri dairy farms than they were for dairy farms in all surveyed states.

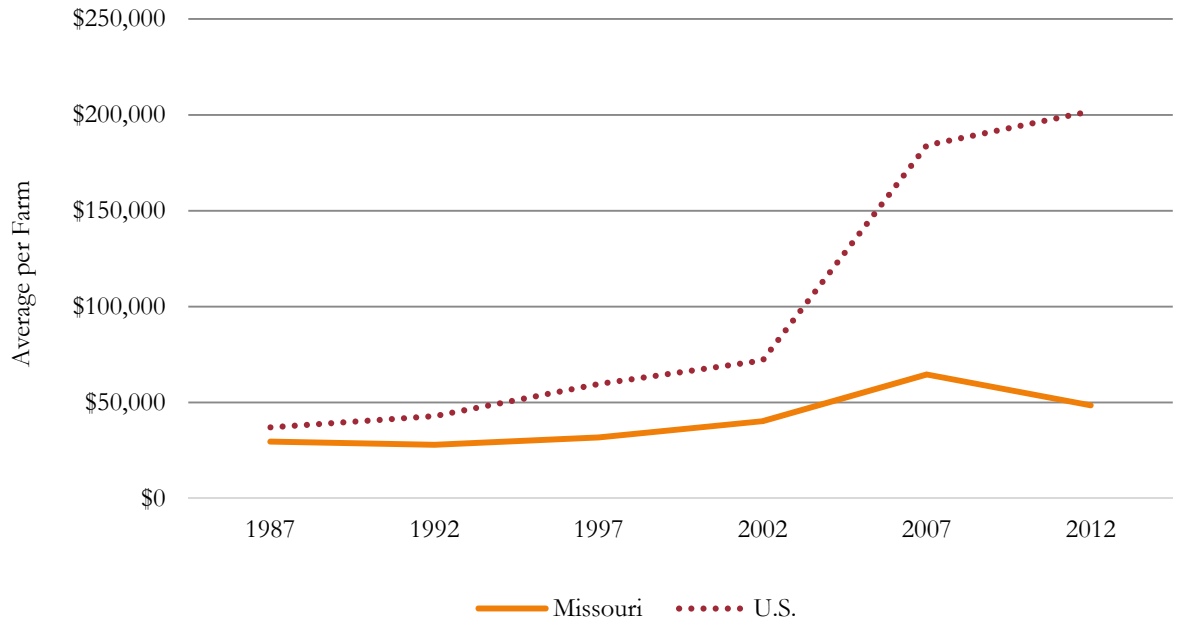
Exhibit 5.3.5 – Dairy Farm Business Debt Repayment Capacity, 2012

Category	Units	All Surveyed States	Missouri
Farms	Number	47,569	1,750
Number of farms with debt	Number	31,384	1,025
Gross cash farm income	Dollars per farm	866,736	178,007
Net farm income	Dollars per farm	164,224	15,406*
Income for debt coverage	Dollars per farm	224,866	21,965
Principal/interest payments	Dollars per farm	53,177	11,367
Debt coverage margin	Dollars per farm	185,269	17,642*
Maximum loan payment	Dollars per farm	85,445	9,782
Total reported debt	Dollars per farm	382,529	85,394
Max feasible debt (7.5%)	Dollars per farm	555,394	116,023
Max feasible debt (10%)	Dollars per farm	519,011	111,835
Repayment capacity use (7.5%)	Percent	68.9	73.6
Repayment capacity use (10%)	Percent	73.7	76.4

* - The estimate is statistically unreliable due to the combination of a low sample size and high sampling error.
Source: USDA, Economic Research Service, Agricultural Resource Management Survey (ARMS)

Since 1987, U.S. dairy farms on average have improved their capacity to generate net cash farm income of operations. For the average U.S. dairy cattle and milk production farm, net cash farm income of operations grew from $37,110 in 1987 to $201,930 in 2012. See Exhibit 5.3.6. For Missouri dairy cattle and milk production farms, net cash farm income of operations has improved; however, the growth hasn't been as strong. The average Missouri dairy cattle and milk production farm generated $29,571 in net cash farm income of operations during 1987. That value increased to $48,569 during 2012, though it had been higher in 2007.

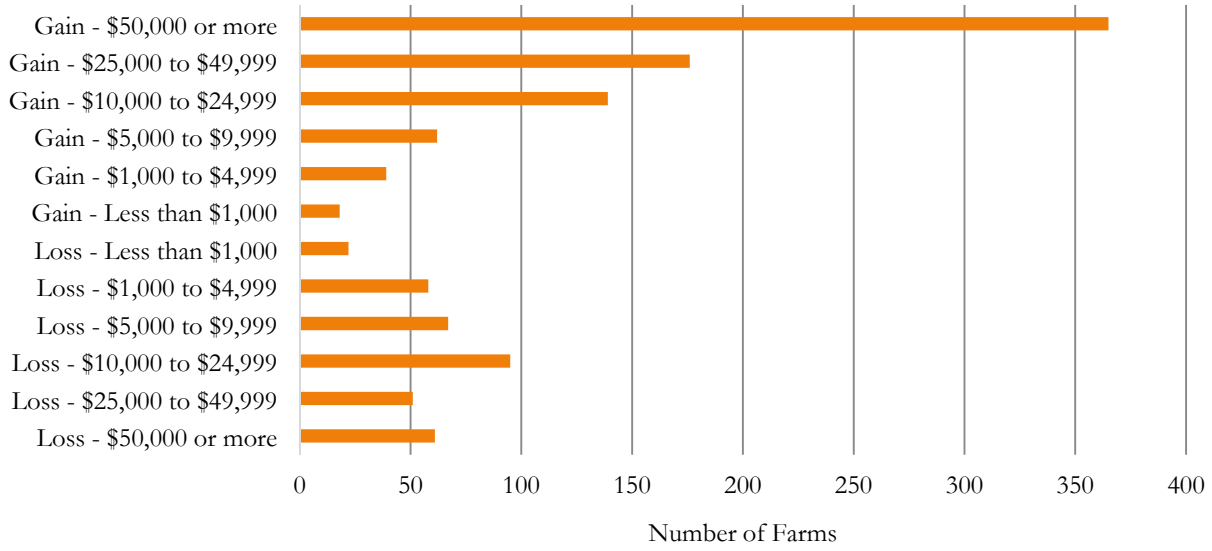
Exhibit 5.3.6 – Missouri and U.S. Average Net Cash Farm Income of Operations on Dairy Cattle and Milk Production Farms, 1987 to 2012



Source: USDA, National Agricultural Statistics Service, Census of Agriculture

During 2012, Missouri dairy cattle and milk production farms predominantly recorded net cash farm income that exceeded a $50,000 gain. Exhibit 5.3.7 illustrates that more than 350 farms indicated that their net cash farm income was more than $50,000. Although most Missouri dairy cattle and milk production farms reported net cash farm income gains during 2012, note that several farms recorded losses. Keep in mind that 2012 was a major drought year, so results will be biased in Missouri. More than 50 farms lost at least $50,000 in net cash farm income in 2012. For these dairy cattle and milk production farms to maintain their long-term viability, they'll need to improve their annual net cash farm income performance.

Exhibit 5.3.7 – Missouri Dairy Cattle and Milk Production Farms, Distribution of Net Cash Farm Income, Gains and Losses, 2012

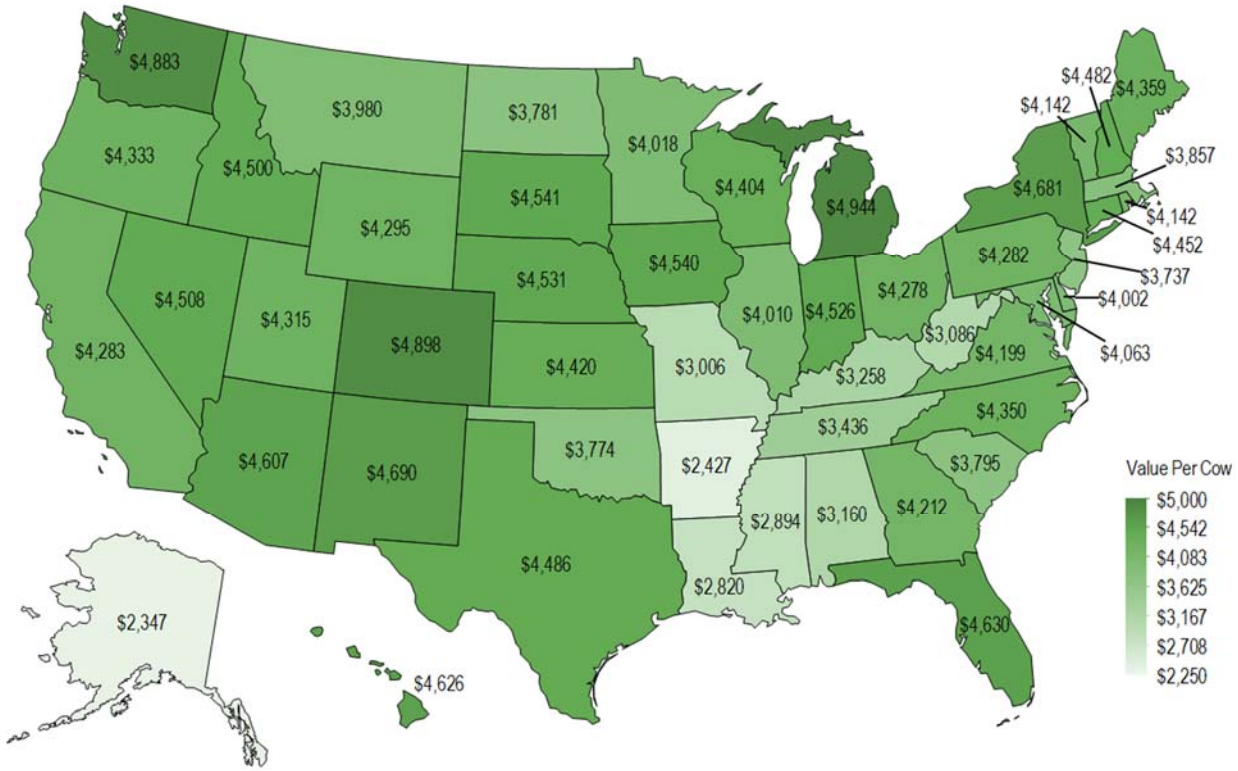


Source: USDA, National Agricultural Statistics Service, Census of Agriculture

5.4 Value of Production

Missouri noticeably averaged less value of milk produced per cow in 2013 than most other states. Only four states had lower values: Alaska, Arkansas, Louisiana and Mississippi. Mid-South states also tended to generate less value of milk per cow than states in other regions. Exhibit 5.4.1 illustrates milk value produced per cow on an average operation. States highlighted in darker colors averaged a higher value of milk per cow than states highlighted in lighter colors. The value of milk includes cash receipts from milk marketing, home consumption and milk fed to calves. States with cows that yielded the greatest value of milk on average were Michigan, Colorado and Washington.

Exhibit 5.4.1 - Value of Milk per Cow, 2013



Source: USDA, National Agricultural Statistics Service

5.5 Land

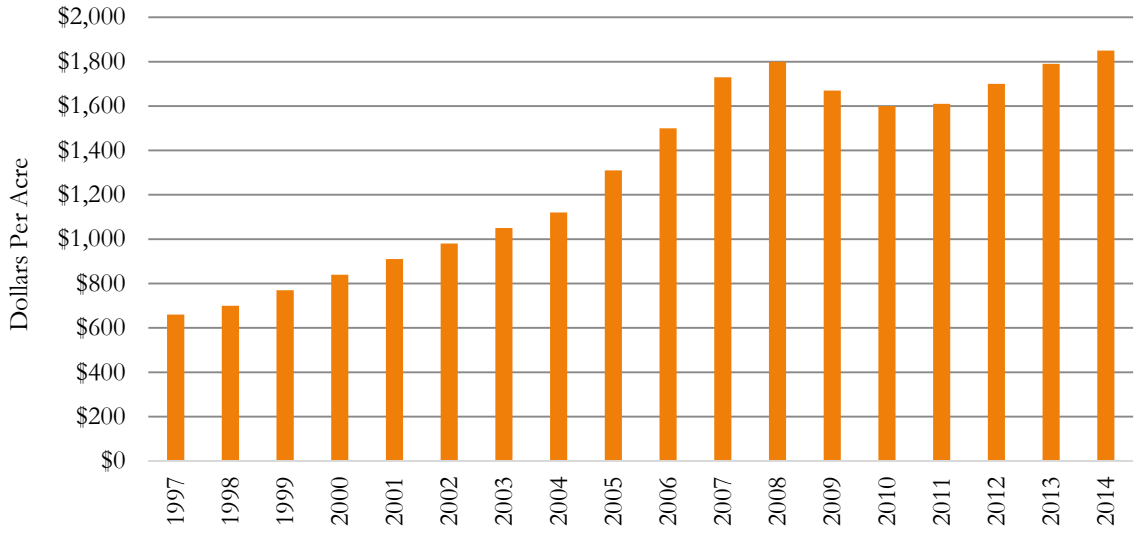
For pasture, Exhibit 5.5.1 shares average values by state for 2014. Pastureland values for each state vary, mainly due to location, land productivity and pressure from alternative uses. In 2014, Missouri pastureland values averaged $1,850 per acre, which is significantly more than pastureland values in many western states and 42.3 percent more than the U.S. average. Between 2013 and 2014, Missouri pasture values increased 3.4 percent, and U.S. pasture value growth averaged 11.1 percent.

Exhibit 5.5.1 – Average Pastureland Values by State, 2014, Dollars per Acre

Source: USDA, National Agricultural Statistics Service

Since 1997, Missouri pasture values have maintained an increasing trend. Exhibit 5.5.2 charts pastureland values from 1997 to 2014. Note that pastureland values steadily increased until 2004. Then, they began to increase quickly. Values recessed somewhat after 2008. However, they've since gained momentum, and they reached their highest point of the observed period during 2014. Between 1997 and 2014, Missouri pastureland values increased 180 percent.

Exhibit 5.5.2 – Missouri Average Pastureland Value, 1997 to 2014, Dollars per Acre



Source: USDA, National Agricultural Statistics Service

Within Missouri, pasture cash rental rates by county vary significantly. See Exhibit 5.5.3. Pasture rental rates ranged from $9.40 per acre in Taney County to $54.00 per acre in Nodaway County. The rental rate averaged $29 per acre in Missouri. These rates reflect rental pasture's relative scarcity and pastureland's productivity and its value to the lessee.

Exhibit 5.5.3 – Average Missouri Pastureland Cash Rent Per Acre, By County, 2014

County	Average Cash Rent		County	Average Cash Rent		County	Average Cash Rent
Adair	$28.50		Gentry	$40.00		Pettis	$33.00
Andrew	$45.00		Grundy	$35.50		Phelps	$18.50
Atchison	$49.50		Harrison	$35.00		Pike	$33.50
Audrain	$32.50		Henry	$37.00		Platte	$30.00
Barry	$21.50		Hickory	$19.00		Polk	$24.00
Barton	$16.50		Holt	$43.50		Pulaski	$21.50
Bates	$37.00		Howard	$32.50		Putnam	$32.00
Benton	$22.00		Howell	$21.50		Ralls	$24.00
Bollinger	$15.50		Iron	$19.00		Randolph	$35.50
Boone	$18.50		Jackson	$34.50		Ray	$43.00
Buchanan	$36.00		Jasper	$34.50		Reynolds	$13.50
Caldwell	$36.00		Jefferson	$13.00		Ripley	$13.50
Callaway	$28.00		Knox	$31.00		Saline	$33.50
Camden	$13.50		Laclede	$18.00		Schuyler	$35.50
Cape Girardeau	$26.50		Lewis	$33.00		Scotland	$32.00
Carroll	$37.00		Lincoln	$24.00		Shannon	$22.00
Carter	$12.50		Linn	$40.00		Shelby	$34.50
Cass	$32.00		Livingston	$23.50		St. Charles	$45.50
Cedar	$29.00		Macon	$31.00		St. Clair	$27.50
Chariton	$38.50		Maries	$20.50		St. Francois	$18.50
Christian	$25.50		Marion	$35.00		Ste Genevieve	$25.00
Clark	$32.00		McDonald	$26.00		Stoddard	$35.50
Clay	$42.00		Mercer	$35.50		Stone	$21.00
Clinton	$45.50		Miller	$22.00		Sullivan	$28.50
Cole	$20.50		Moniteau	$28.00		Taney	$9.40
Cooper	$29.50		Monroe	$28.50		Texas	$28.00
Crawford	$12.50		Montgomery	$24.50		Vernon	$32.00
Dade	$28.00		Morgan	$23.00		Warren	$31.00
Dallas	$22.50		Newton	$29.50		Washington	$11.50
Daviess	$51.50		Nodaway	$54.00		Wayne	$21.00
DeKalb	$35.00		Oregon	$14.50		Webster	$24.00
Dent	$14.50		Osage	$20.00		Worth	$45.50
Franklin	$26.50		Ozark	$15.50		Wright	$21.50
Gasconade	$17.50		Perry	$36.50			

Source: USDA, National Agricultural Statistics Service

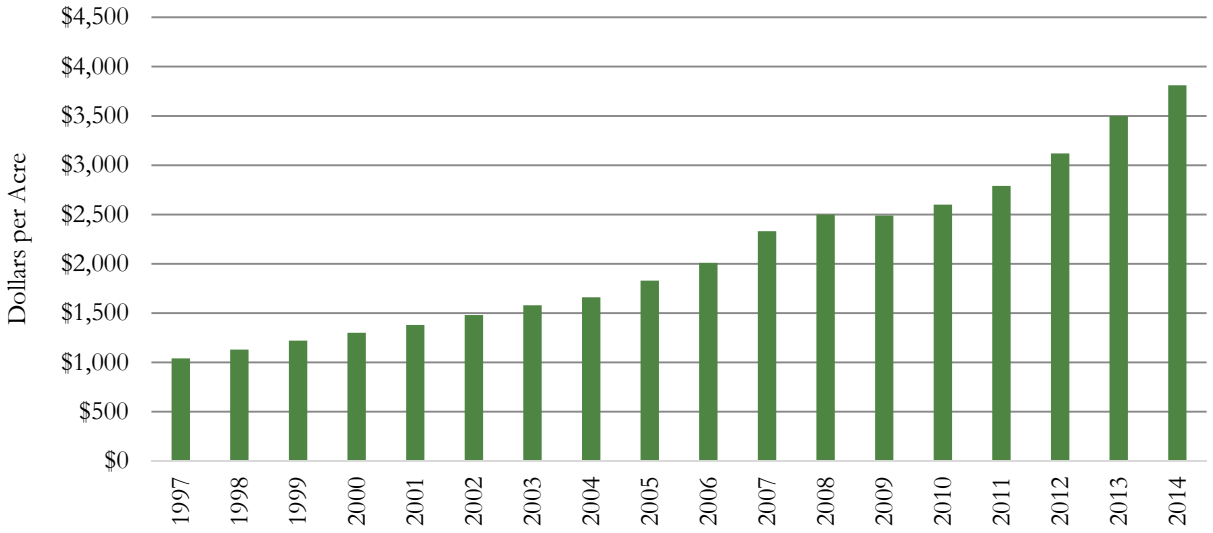
Cropland land values represent critical overhead costs associated with raising dairy cattle because producers typically need land for feed production, such as raising corn silage, and manure application. Relative to other states, Missouri farmland is less expensive than land in most of the states to the east and directly north, and it's more expensive than land in many states west of Missouri. Exhibit 5.5.4 shares average cropland values by state for 2014. The Missouri cropland value averaged $3,810 per acre, which is 7 percent lower than the U.S. average value per acre of $4,100. Between 2013 and 2014, Missouri cropland values increased an estimated 8.9 percent, which was faster growth than U.S. cropland value growth, which averaged 7.6 percent.

Exhibit 5.5.4 – Cropland Value by State, 2014, Dollars per Acre

Source: USDA, National Agricultural Statistics Service

Like pastureland values, Missouri cropland values have also increased since 1997. Exhibit 5.5.5 charts cropland value growth from 1997 to 2014. Relative to Missouri pastureland values, Missouri cropland values increased more during the observed period. Between 1997 and 2014, Missouri cropland values grew more than 266 percent. Just within the past five years, cropland values grew 46.5 percent. In the chart, note that in all but one year prices maintained the increasing trend. From 2008 to 2009, cropland values dropped slightly, but they quickly rebounded in 2010.

Exhibit 5.5.5 – Average Missouri Cropland Value, 1997 to 2014, Dollars per Acre

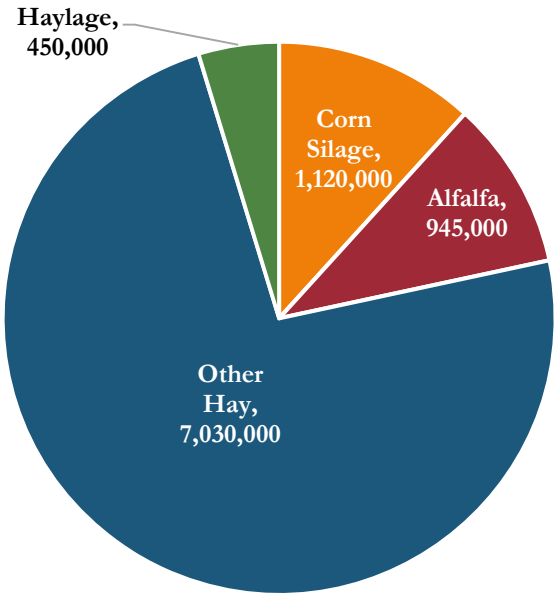


Source: USDA, National Agricultural Statistics Service

5.6 Forages

Missouri produces several types of forage: hay, haylage, grass silage and greenchop. Exhibit 5.6.1 shares 2013 forage production data for Missouri in tons. The state's total forage production exceeded 9.5 million tons. As illustrated, "other hay" was the predominant forage produced during 2013. It represented nearly three-fourths of the state's total forage production. Corn silage, alfalfa and haylage followed "other hay" as the most popular forages produced.

Exhibit 5.6.1 – Missouri Forage Production in Tons, 2013



Source: USDA, National Agricultural Statistics Service

Relative to other states, Missouri ranked 11th for total forage production during 2013. Exhibit 5.6.2 lists states ranked in the top 15 for their 2013 total forage production. Of these states, Texas was the largest "other hay" producer during 2013, and Missouri produced the second most "other hay." Of the states observed, California led in alfalfa hay production, and Wisconsin led in both haylage and corn silage production. The three states that produced the most forage during 2013 – Wisconsin, California and New York – raised more corn silage than any other forage. These states also led the U.S. as the three states that produced the most milk during 2013.

Exhibit 5.6.2 – Top 15 States in Forage Production in Tons, 2013

State	Alfalfa Hay	Other Hay	Haylage	Corn Silage	Total
	tons	*tons*	*tons*	*tons*	*tons*
Wisconsin	2,860,000	900,000	6,600,000	16,170,000	26,530,000
California	6,120,000	1,836,000	3,472,000	10,997,500	22,425,500
New York	770,000	2,160,000	4,184,000	8,500,000	15,614,000
Texas	630,000	8,250,000	940,000	3,800,000	13,620,000
Pennsylvania	986,000	1,932,000	2,783,000	7,790,000	13,491,000
Minnesota	2,470,000	1,425,000	1,996,000	6,270,000	12,161,000
Idaho	4,256,000	720,000	1,051,000	5,850,000	11,877,000
Iowa	2,409,000	968,000	749,000	7,410,000	11,536,000
Michigan	1,891,000	627,000	2,123,000	5,950,000	10,591,000
South Dakota	3,780,000	2,125,000	380,000	3,640,000	9,925,000
Missouri	945,000	7,030,000	450,000	1,120,000	9,545,000
Nebraska	2,415,000	2,520,000	258,000	4,160,000	9,353,000
Kansas	1,925,000	4,620,000	228,000	1,950,000	8,723,000
Kentucky	660,000	5,280,000	0	1,680,000	7,620,000
North Dakota	3,240,000	1,850,000	0	1,680,000	6,770,000

Source: USDA, National Agricultural Statistics Service

On a tons per cow basis, North Dakota led other states in both alfalfa hay and corn silage production as it produced 180 tons per cow and 93.3 tons per cow, respectively, during 2013. Exhibit 5.6.3 shares alfalfa hay and corn silage production in tons per cow for several U.S. states. Based on tons of production per cow, Nebraska and South Dakota ranked second and third, respectively, for alfalfa hay and corn silage production in 2013.

Exhibit 5.6.3 – Top 15 States in Forage Production, Alfalfa and Corn Silage, Tons/Cow, 2013

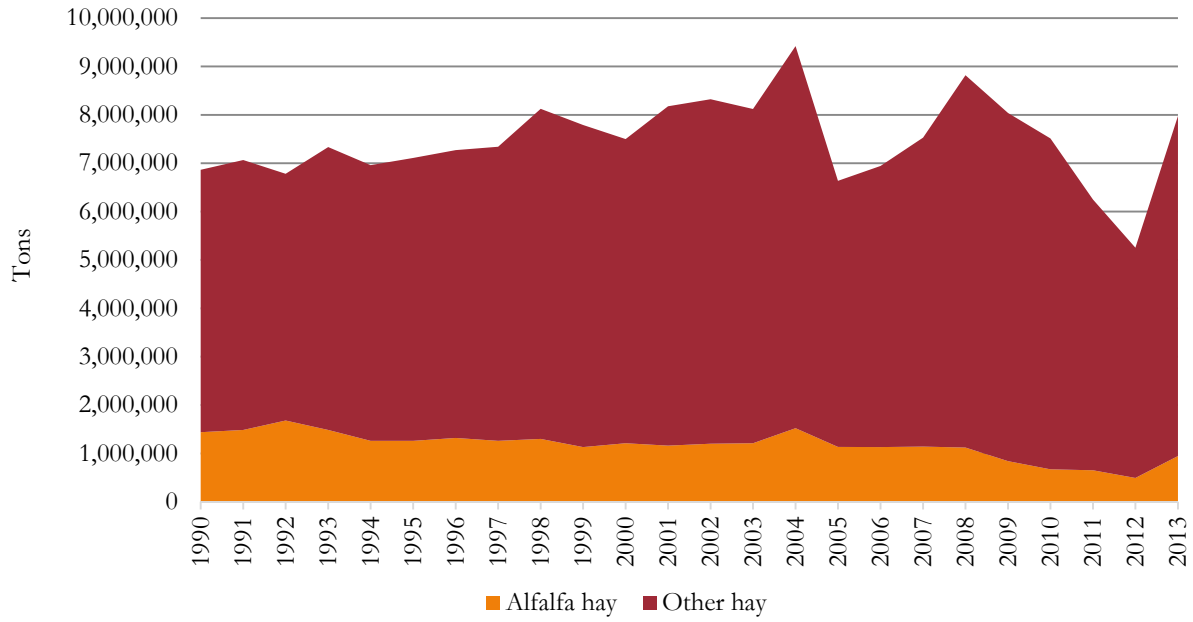
State	Alfalfa Hay *Tons/cow*	Corn Silage *Tons/cow*
Wisconsin	2.3	12.7
California	3.4	6.2
New York	1.3	13.9
Texas	1.4	8.7
Pennsylvania	1.8	14.6
Minnesota	5.3	13.5
Idaho	7.4	10.2
Iowa	11.6	35.6
Michigan	5.0	15.7
South Dakota	40.2	38.7
Missouri	10.3	12.2
Nebraska	44.7	77.0
Kansas	14.4	14.6
Kentucky	9.3	23.7
North Dakota	180.0	93.3

Source: Derived from USDA, National Agricultural Statistics Service

Missouri is a major hay-producing state. On average, the state produced just more than 7 million tons of hay per year between 2009 and 2013. Exhibit 5.6.4 illustrates the trend in Missouri alfalfa and all other hay production from 1990 to 2013. Missouri steadily increased its hay production from 1990 to the early 2000s. Since then, production has been more volatile. Note that total hay production was lowest in 2012, when severe drought limited hay growth and production potential.

From 2009 to 2013, alfalfa production on average represented 10.2 percent of all Missouri-produced hay. "Other hay" usually is tall fescue or a grass-legume hay mix that contains fescue. Missouri farmers do not sell most hay they produce. Instead, they typically use it for on-farm animal feeding.

Exhibit 5.6.4 – Trend in Missouri Hay Production, 1990 to 2013

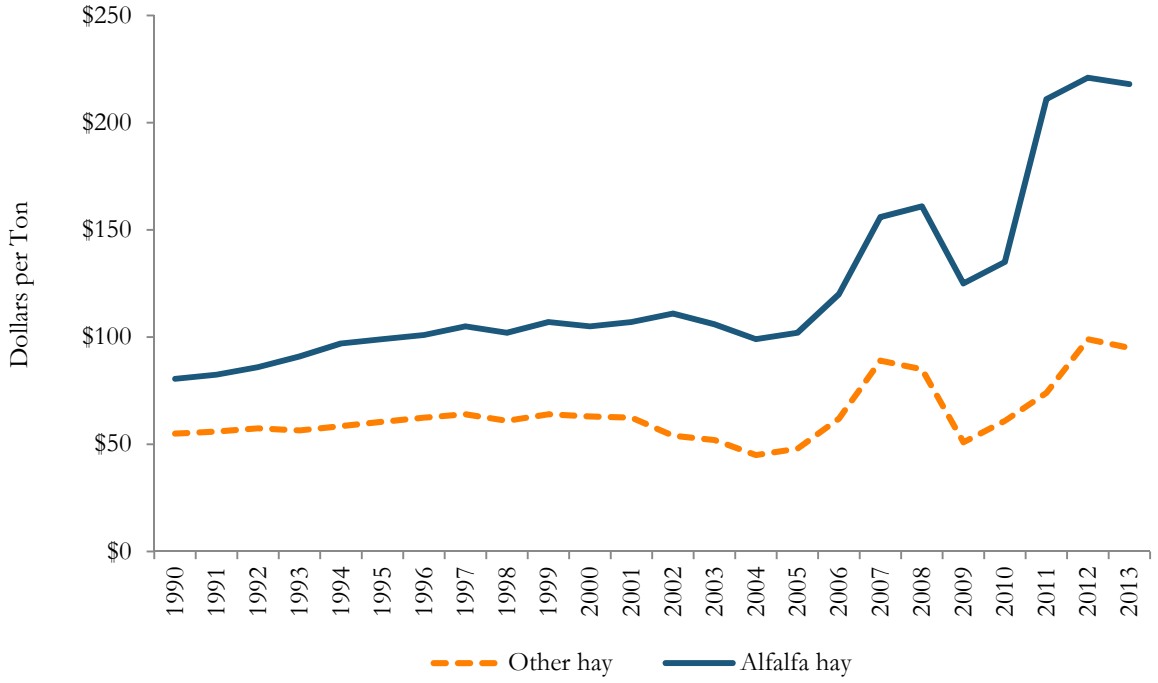


Source: USDA National Agricultural Statistics Service

Hay prices are a function of hay demand and supply. Exhibit 5.6.5 charts Missouri alfalfa and other hay prices from 1990 to 2013. During the observed period, prices noticeably jumped two different times. The first occurred in the mid-2000s, and the second occurred from 2010 to 2012. Production output influenced both price movements, as noted when correlating production data from the previous exhibit and the price trends shown in Exhibit 5.6.5.

Exhibit 5.6.5 also highlights the difference between alfalfa hay and other hay prices. Both prices move in a similar pattern. However, note the premium paid for alfalfa hay. From 2009 to 2013, alfalfa hay prices averaged being 2.4 times more than other hay prices in Missouri.

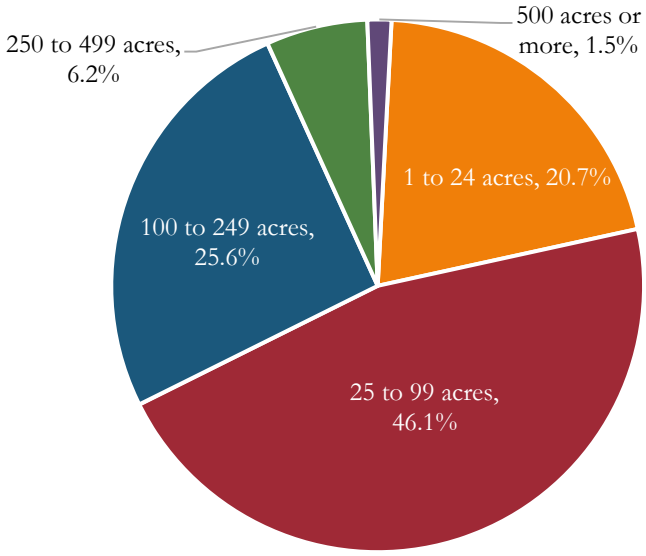
Exhibit 5.6.5 – Missouri Average Hay Price Received by Farmers, 1990 to 2013



Source: USDA, National Agricultural Statistics Service

In Missouri, 46.1 percent of dairy cattle and milk production farms harvested between 25 acres and 99 acres of forage during 2012. See Exhibit 5.6.6. Slightly more than one-quarter harvested 100 forage acres to 249 forage acres in 2012. Very few Missouri dairy cattle and milk production farms – 7.7 percent of those reporting forage production – harvested at least 250 forage acres in 2012, and about one-fifth harvested less than 25 acres of forage.

Exhibit 5.6.6 –Number of Dairy Farms by Forage Acres Harvested, 2012



Source: USDA, National Agricultural Statistics Service, Census of Agriculture

5.7 Co-Products

Ethanol facilities, soy crush plants, biodiesel facilities and cotton gins generate co-products that Missouri dairy farmers may use when formulating rations for their herds. At ethanol production facilities, a plant's outputs include not only ethanol but also dried distillers grains that have feed value. Within Missouri, the Renewable Fuels Association reports that six ethanol facilities operate. The proximity of these Missouri-based plants and other nearby plants in surrounding states provides Missouri cattle producers with several outlets from which they could source co-product feeds. Exhibit 5.7.1 lists Missouri ethanol facilities and further outlines details about these plants.

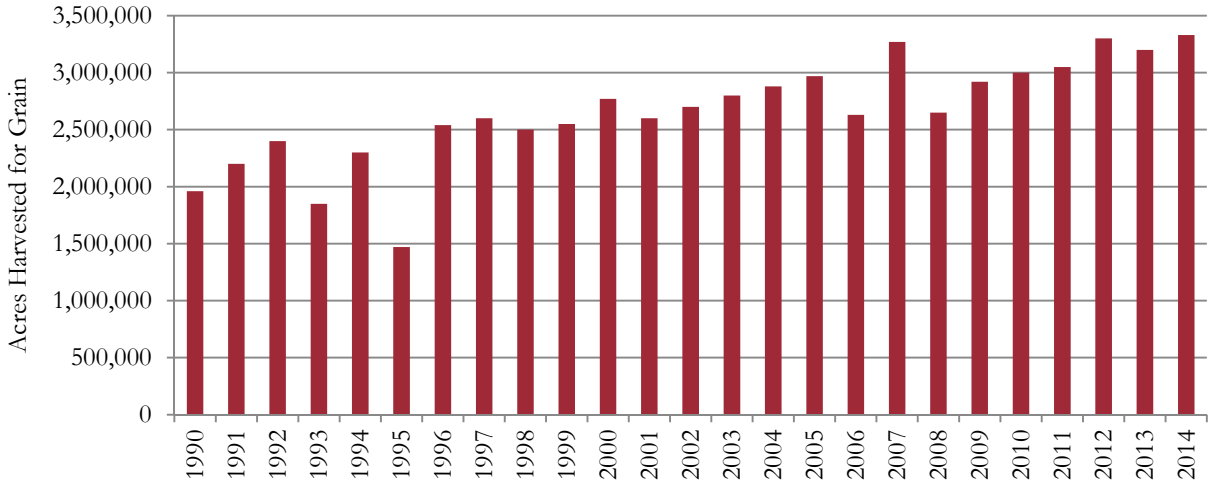
Exhibit 5.7.1 – Missouri Corn Ethanol Production Facilities

Facility	Location	Nameplate Capacity (mgy)	Operating Production (mgy)	DDG Capacity (tons)*
Golden Triangle Energy, LLC	Craig, MO	20	5	15,179
Lifeline Foods	St. Joseph, MO	50	50	151,786
Mid-Missouri Energy, Inc.	Malta Bend, MO	50	50	151,786
POET Biorefining – Laddonia	Laddonia, MO	50	50	151,786
POET Biorefining – Macon	Macon, MO	46	46	139,643
Show Me Ethanol	Carrollton, MO	55	55	166,964

*Based on 17 lbs of DDG per bushel used and 2.8 gallons of ethanol per bushel.
Source: Renewable Fuels Association

Since 1990, Missouri farmers have sharply increased their corn production output. Exhibit 5.7.2 illustrates the change in Missouri corn acreage harvested for grain production. In 1990, Missouri harvested 1.96 million corn acres for grain production. Total corn acreage harvested for grain increased to 3.33 million acres by 2014. Between these two periods, acreage harvested grew 69.9 percent. Increasing corn production signals a possible increase in co-products available for feed.

Exhibit 5.7.2 – Missouri Corn Acreage Harvested for Grain, 1990 to 2014



Source: USDA, National Agricultural Statistics Service

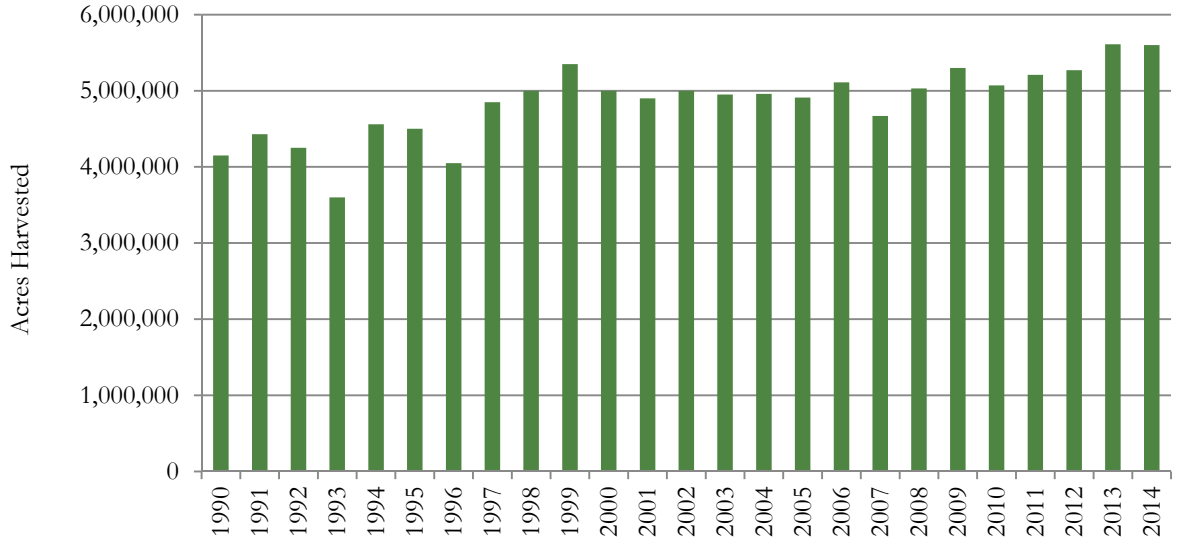
At soy crushing facilities, meal and hulls are two outputs that have feed value in livestock rations. In Missouri, four soybean crushing facilities operate. Exhibit 5.7.3 lists these facilities and their locations. Three facilities operate in western Missouri, and one operates in eastern Missouri. In addition to these facilities buying Missouri soybeans and supplying processed products to Missouri buyers, two Illinois facilities – one in Quincy and one in Cairo – also serve eastern Missouri, and one Kansas facility in Emporia serves western Missouri.

Exhibit 5.7.3 – Missouri Soybean Crushing Facilities

Facility	Location
Ag Processing, Inc.	St. Joseph, MO
Cargill	Kansas City, MO
ADM	Deerfield, MO
ADM	Mexico, MO

Like corn acreage harvested, soybean acreage harvested has also grown since 1990. During 1990, Missouri producers harvested 4.15 million acres, and harvested acreage increased to 5.6 million acres in 2014. Exhibit 5.7.4 illustrates the increase in harvested soybean acreage. The 34.9 percent growth indicates that more soybean products may be available for incorporating into livestock feed rations.

Exhibit 5.7.4 – Missouri Soybean Acreage Harvested for Grain, 1990 to 2014



Source: USDA, National Agricultural Statistics Service

Like soybean crushing plants, cotton gins also yield meal and hulls that have potential application in animal feeds. The Cotton Board reports active gins in its gin code list for 2014. According to that list, 29 active cotton gins operate in Missouri, and these facilities are concentrated in five southeastern counties: Dunklin, New Madrid, Pemiscot, Scott and Stoddard. Exhibit 5.7.6 lists these facilities by name and county. Dunklin County has more facilities than any other county. For dairies located in Missouri, cotton gin byproducts may be viable feed ingredients.

Exhibit 5.7.6 – Missouri Cotton Gins

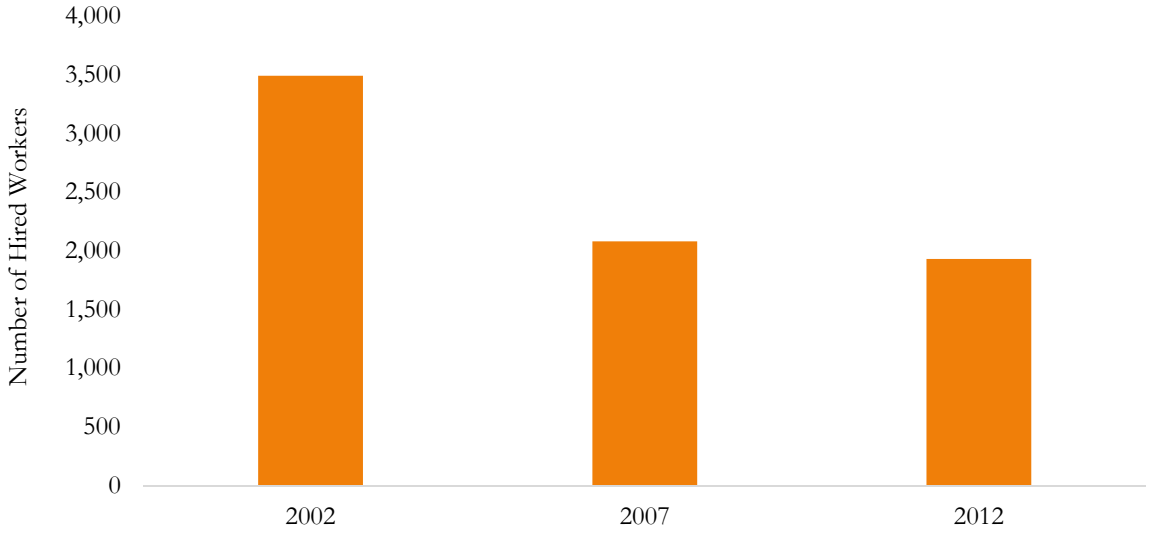
Facility	City	County
B&B Cotton Company	Campbell, MO	Dunklin
Cardwell Coop Gin #1	Cardwell, MO	Dunklin
Little River Gin, Inc.	Hornersville, MO	Dunklin
Dunklin Graves Kennett Gin	Kennett, MO	Dunklin
Stephens Gin Company	Kennett, MO	Dunklin
Stokes-Mayberry Gin Co., Inc.	Malden, MO	Dunklin
Bernie Farmers Gin, LLC	Malden, MO	Dunklin
Farmers Union Gin Company	Senath, MO	Dunklin
Four Way Gin Company	Senath, MO	Dunklin
Sandy Ridge Cotton Co.	Malden, MO	Dunklin
Whiteoak Gin Company, Inc.	Whiteoak, MO	Dunklin
Dalton Cotton Company, Inc.	Senath, MO	Dunklin
McCord Gin Company, Inc.	Gideon, MO	New Madrid
Richardson Gin, Inc.	Marston, MO	New Madrid
Bootheel Cotton Company	Matthews, MO	New Madrid
A.C. Riley Cotton Company	New Madrid, MO	New Madrid
Mahan Gin Company	Parma, MO	New Madrid
Portageville Farmers Gin, Inc.	Portageville, MO	New Madrid
D. G. & G., Inc.	Matthews, MO	New Madrid
Caruthersville Gin, Inc.	Caruthersville, MO	Pemiscot
Cooter Cotton Gin, Inc.	Cooter, MO	Pemiscot
L. Berry Gin Company	Holland, MO	Pemiscot
Peach Orchard Gin Company, Inc.	Gideon, MO	Pemiscot
Still Gin Company	Steele, MO	Pemiscot
Crowder Gin Company	Sikeston, MO	Scott
Vanduser Gin Co., Inc.	Vanduser, MO	Scott
J. P. Ross Cotton Co., Inc.	Essex, MO	Stoddard
D. G. & G. Cotton Gin, Inc.	Sikeston, MO	Stoddard
Stoddard County Cotton Co.	Bernie, MO	Stoddard

Source: The Cotton Board

5.8 Labor

As the Missouri dairy industry has constricted, it has decreased the number of hired workers needed to facilitate operations. Based on data reported in the last three agriculture censuses, Exhibit 5.8.1 charts the number of workers hired by dairy cattle and milk production farms. In 2012, Missouri dairy cattle and milk production farms employed just 55 percent of the workers that it had employed in 2002. Although the industry's hired worker total has decreased, the dairy cattle and milk production farms industry still supported 1,931 hired workers in 2012.

Exhibit 5.8.1 – Missouri Hired Farm Labor on Dairy Cattle and Milk Production Farms (NAICS Code 11212), 2002, 2007 and 2012



Source: USDA, National Agricultural Statistics Service, Census of Agriculture

Farm labor wages in Missouri have risen strongly in recent years, and this reflects a national trend. In the 10-year period presented in Exhibit 5.8.2, the price of field and livestock labor in Missouri and Iowa increased from $9.28 per hour in 2003 to $12.22 an hour in 2013. The $2.94 per hour increase equates to 31.7 percent growth in labor costs. At an annual compound rate, field and livestock hired worker wage rates increased 2.53 percent.

Exhibit 5.8.2 - Farm Labor Wage Rates, Missouri and Iowa (Cornbelt II), 2003 to 2013

Year	All Hired Workers	Field Hired Worker	Field and Livestock Hired Worker
	(Dollars per hour)		
2003	$9.75	$9.21	$9.28
2004	$9.45	$8.79	$8.95
2005	$10.17	$9.01	$9.50
2006	$10.65	$9.39	$9.95
2007	$11.10	$9.89	$10.44
2008	$11.24	$10.57	$10.77
2009	$11.22	$10.64	$10.86
2010	$11.18	$10.96	$11.03
2011	$11.67	$11.84	$11.50
2012	$11.85	$11.80	$11.41
2013	$13.07	$12.19	$12.22

Source: USDA, National Agricultural Statistics Service, Farm Labor Summary

5.9 Herd Management

The Dairy Herd Information Association (DHIA) records several data indicators that may help dairy producers make management decisions. The charts in this section share data downloaded from the DHIA database. Note that the southeast category shared in these exhibits represents South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Arkansas, Kentucky and Tennessee. Missouri had 264 farms on DHI in October 2014, reflecting 29.5% of all Grade A Dairies or 21.2% of all dairy farms.

Missouri herds tend to average fewer lactating cows than average herds in the other three areas. Feed costs and income were two other factors that varied for Missouri and the other geographic areas. In Missouri and the southeast U.S. states, feed costs tend to be higher when evaluated on a milk production basis. See Exhibit 5.9.1. During October 2014, Missouri dairy farms incurred $9.10 in feed costs per 100 pounds of milk produced. The average U.S. dairy farm, however, spent $1.50 less per hundredweight produced for feed. Missouri and the southeast U.S. region both performed poorly from a milk production value perspective during October 2014. The U.S. average for days in milk is lower than the averages for Missouri, surrounding states and the southeast U.S. Age of first lactation and mortality rate are similar for the four geographic areas reported.

Exhibit 5.9.1 – General DHIA Statistics, Missouri vs. Other Areas, October 2014

Category	Unit	Missouri		Surrounding States		Southeast U.S.		U.S.	
		Herds	Avg.	Herds	Avg.	Herds	Avg.	Herds	Avg.
Number of Cows-All Lact	Number	264	135.6	1,424	162.1	611	234.0	12,545	172.3
Number of Cows-1st Lact	Number	264	44.4	1,418	63.5	605	93.3	12,530	66.2
Number of Cows-2nd Lact	Number	263	38.6	1,422	45.0	610	62.6	12,531	47.9
Number of Cows-3rd Lact	Number	263	52.9	1,417	54.2	604	80.1	12,506	58.5
Days in Milk	Days	264	194.6	1,424	192.7	611	199.6	12,545	184.8
Age of 1st Lact Cows	Months	263	26.8	1,418	26.2	606	26.5	12,519	26.0
Cows Left Herd-All Lact	Percent	248	35.0	1,368	38.3	573	37.6	12,040	36.7
Cows Died-All Lact	Percent	264	5.7	1,424	5.8	611	5.7	12,545	5.0
Daily Val Prod-Milk Cows	Dollars	264	$13.3	1,424	$14.9	611	$13.30	12,543	$15.5
Daily Feedcost-Milk Cows	Dollars	115	$4.9	421	$5.3	164	$5.70	2,118	$4.9
Daily Feedcost/Cwt Milk	Dollars	121	$9.1	438	$8.5	164	$10.30	2,285	$7.6
Daily Inc/Feed-Milk Cows	Dollars	121	$9.0	440	$9.8	165	$8.80	2,295	$11.1

Source: Dairy Herd Information Association (DHIA), Dairy Records Management Systems (DRMS)

Of the four geographic areas evaluated, Missouri herds averaged the lowest rolling milk production, daily milk production, rolling fat content and rolling protein content. Exhibit 5.9.2 further describes production-related statistics. The peak milk data indicates that the peak production difference between the total U.S. and Missouri increases between the first lactation period and the second to third lactation periods. Production output measured in the rolling milk value is important because production output greatly influences a producer's income potential. The daily milk production, projected milk production and standardized milk production data sets all suggest that Missouri lags the averages for surrounding states, the southeast U.S. and the U.S. as a whole.

Exhibit 5.9.2 – Production DHIA Statistics, Missouri vs. Other Areas, October 2014

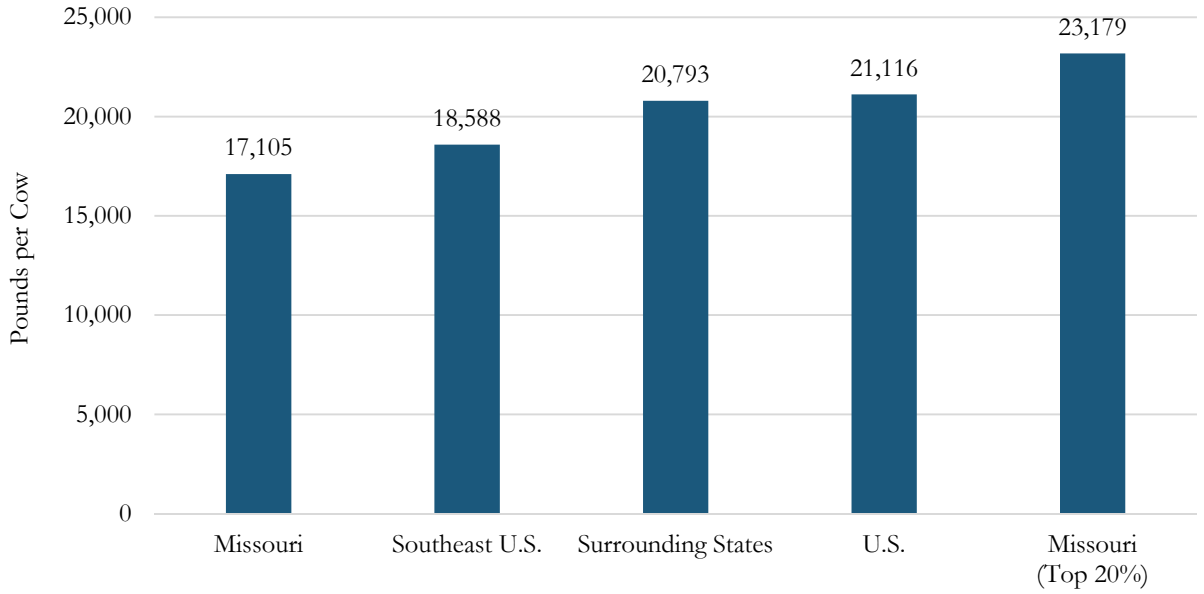
Category	Unit	Missouri		Surrounding States		Southeast U.S.		U.S.	
		Herds	Avg.	Herds	Avg.	Herds	Avg.	Herds	Avg.
Rolling Milk	Pounds	249	17,105.0	1,377	20,792.6	576	18,587.5	12,077	21,115.9
Rolling Fat	Pounds	249	660.5	1,363	787.9	537	688.7	11,980	807.8
Rolling Protein	Pounds	249	546.7	1,363	654.9	537	576.2	11,973	655.3
Daily Milk-Milk cows	Pounds	260	53.1	1,415	63.8	601	55.2	12,412	65.7
Daily Fat	Percent	264	3.9	1,412	3.8	579	3.7	12,455	3.8
Daily Protein	Percent	264	3.2	1,412	3.2	579	3.2	12,451	3.1
Peak Milk 1st Lact	Pounds	259	60.9	1,402	73.0	595	66.8	12,415	73.7
Peak Milk 2nd Lact	Pounds	259	75.8	1,407	91.1	597	82.5	12,418	92.4
Peak Milk 3rd+ Lact	Pounds	259	83.6	1,404	98.6	597	89.4	12,406	100.1
Proj 305 Day ME Milk	Pounds	262	18,481.5	1,417	22,389.4	605	20,434.6	12,508	22,904.1
Standardized 150 Day Milk	Pounds	262	59.7	1,421	71.4	607	63.6	12,473	72.1

Source: Dairy Herd Information Association (DHIA), Dairy Records Management Systems (DRMS)

Although production output is important, compositional data related to fat and protein also matter because they too affect income. Fat and protein are two components to prioritize. Again, on a rolling basis, Missouri lags the other three geographic areas in delivering high fat and protein levels. Note that the daily component data indicate that Missouri milk performs better than the average U.S. milk. During October 2014, daily fat content averaged 3.9 percent in Missouri relative to 3.8 percent for the U.S., and daily protein content averaged 3.2 percent in Missouri relative to 3.1 percent for the U.S. Missouri dairies would benefit from optimizing fat and protein components on a rolling basis.

It is also important to consider, however, that some producers in Missouri are exceeding rolling herd averages from the four geographic regions. Exhibit 5.9.3 shows the rolling herd averages from regions noted in the previous exhibit, and it includes the average from Missouri producers that were in the top 20 percent for rolling herd averages. Missouri's top 20 percent producers averaged 23,179 pounds per cow during October 2014, which is nearly 10 percent higher than the U.S. average.

Exhibit 5.9.3 – Rolling Herd Average, October 2014



Source: Dairy Herd Information Association (DHIA), Dairy Records Management Systems (DRMS)

To improve udder health, producers target reducing somatic cell counts. A somatic cell count reading indicates the extent to which a cow's udder is experiencing inflammation and mastitis. Exhibit 5.9.4 shares four somatic cell count measures for Missouri, its surrounding states, the southeastern U.S. and the U.S. average. For the actual somatic cell count and the somatic cell count score, only the southeast U.S. scored higher than Missouri. During October 2014, 62.4 percent of Missouri milk cows scored between zero and three for somatic cell count.

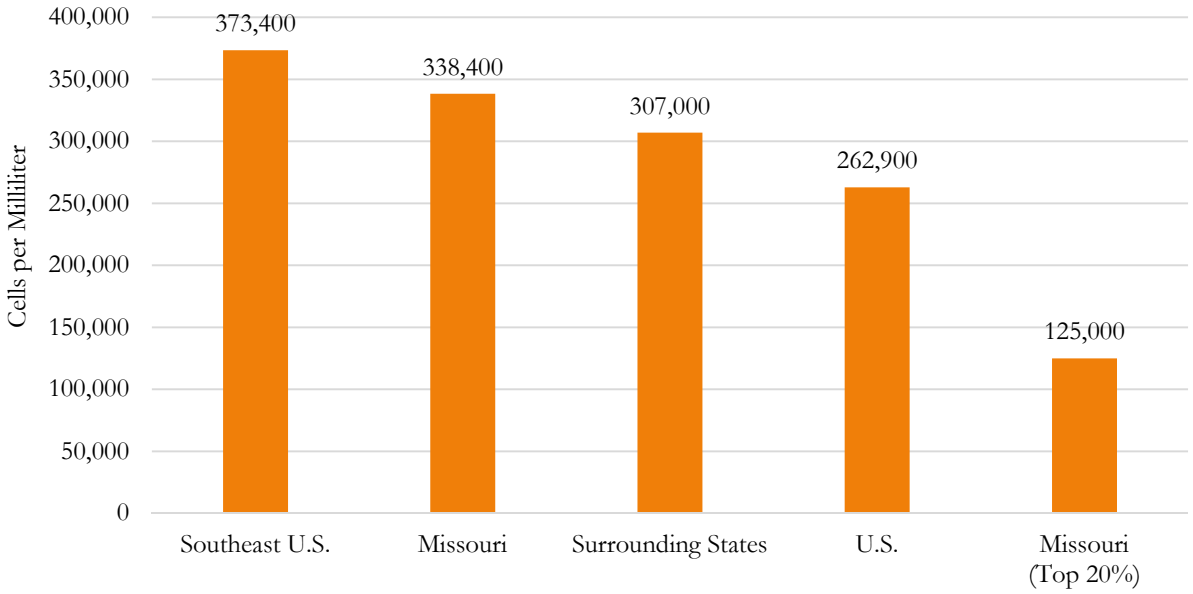
Exhibit 5.9.4 – Udder Health DHIA Statistics, Missouri vs. Other Areas, October 2014

Category	Unit	Missouri		Surrounding States		Southeast U.S.		U.S.	
		Herds	Avg.	Herds	Avg.	Herds	Avg.	Herds	Avg.
SCC Actual	x thousands	262	338.4	1,383	307.0	543	373.4	11,866	262.9
SCC Score	Linear or log	264	3.0	1,405	2.9	546	3.2	12,275	2.7
Cows (SCC of 0-3)	Percent	264	62.4	1,405	64.3	546	57.9	12,280	68.5
Cows (<41D with SCC>4)	Percent	242	32.8	1,394	29.0	595	32.8	12,281	24.2

Source: Dairy Herd Information Association (DHIA), Dairy Records Management Systems (DRMS)

Exhibit 5.9.5 demonstrates the somatic cell count averages for the four geographic regions along with Missouri producers that were in the top 20 percent in milk quality. Note that Missouri's top 20 percent averaged 125,000 cells per milliliter, under half the size of the U.S. average of 262,900. This indicates that some Missouri milk producers have had success in managing somatic cell counts.

Exhibit 5.9.5 – Somatic Cell Counts, October 2014



Source: Dairy Herd Information Association (DHIA), Dairy Records Management Systems (DRMS)

Compared with the U.S. average, Missouri dairy cows had a lower pregnancy rate, more days open, longer time span to first service and a lower share for heats observed per year based on October 2014 DHIA data. These data indicate several reproduction-related improvement needs for Missouri dairy herds. Exhibit 5.9.6 provides these data points and other 2014 reproduction-related DHIA statistics for Missouri, its surrounding states, the southeastern U.S. and the U.S. as a whole. Although Missouri dairy cows did not perform as well on several reproduction measures during 2014, they did well on a few measures. Relative to the U.S. average, Missouri dairy cows had a better first service conception rate and fewer abortions for the year, based on the October 2014 data.

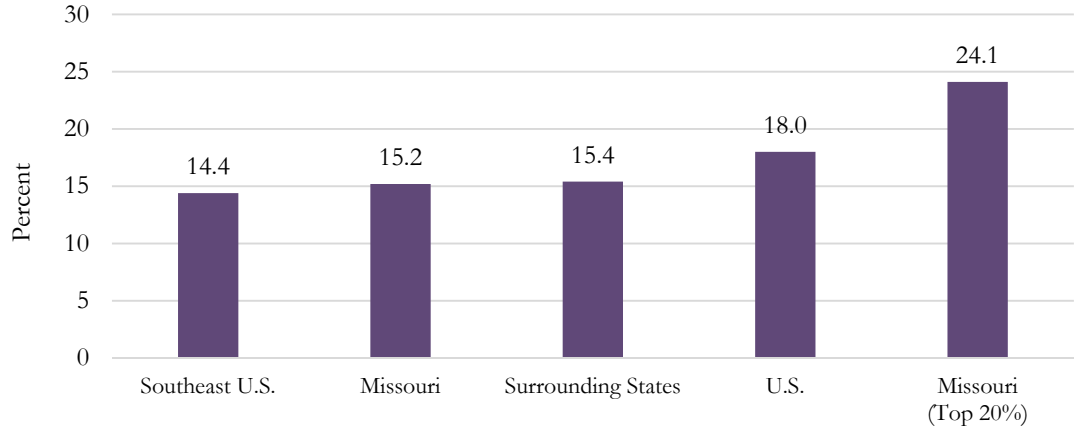
Exhibit 5.9.6 – Reproduction DHIA Statistics, Missouri vs. Other Areas, October 2014

Category	Unit	Missouri		Surrounding States		Southeast U.S.		U.S.	
		Herds	Avg.	Herds	Avg.	Herds	Avg.	Herds	Avg.
Preg Rate-Year Ave	Percent	156	15.2	876	15.4	388	14.4	10,218	18.0
Days Open-Proj Min-Total Herd	Days	262	177.6	1,414	171.1	604	177	12,499	152.6
Proj Calving Interval	Months	263	15.1	1,421	14.9	608	15.1	12,536	14.3
Actual Calving Interval	Months	260	13.9	1,421	14.1	606	14	12,526	13.7
Voluntary Waiting Period	Days	264	57.5	1,424	55.3	611	57.6	12,545	58.7
Days to 1st Serv-Total Herd	Days	240	98.6	1,334	100.2	579	102.8	12,172	93.1
Con Rate for Past 12M-1st Serv	Percent	264	45.7	1,424	43.5	611	48.4	12,545	41.3
Serv per Preg-All Lact	Number	240	2.6	1,334	2.7	581	2.5	12,172	2.8
Heats Observed for Year	Percent	222	36.3	1,267	37.9	524	34.9	11,795	44.4
Abortions in Past Year	Number	264	0.4	1,424	0.8	611	1.6	12,545	2.4

Source: Dairy Herd Information Association (DHIA), Dairy Records Management Systems (DRMS)

Based on the reproduction-related discussion from the previous exhibit, Exhibit 5.9.7 adds Missouri's top 20 percent operations based on reproduction to evaluate their pregnancy rates relative to rates recorded in the other four geographic areas. The chart illustrates that the pregnancy rate recorded by the top 20 percent of Missouri producers, which averaged 24.1 percent, clearly exceeds the U.S. average of 18 percent.

Exhibit 5.9.7 – Pregnancy Rates, October 2014



Source: Dairy Herd Information Association (DHIA), Dairy Records Management Systems (DRMS)

5.10 Organic Milk Production

Organic has become an alternative dairy production method and marketing niche. During the 2009 recession, a Missouri organic milk marketing cooperative lost its organic milk supply contract. This loss of marketing channel caused several certified organic dairies to permanently shift back to conventional production. Nine farms in Missouri with milk cows had organic certification in 2011, based on the USDA 2011 Certified Organic Production Survey. On Dec. 31, 2011, Missouri certified organic farms had 608 milk cows. See Exhibit 5.10.1. All Missouri organic dairy farms sell their milk as certified organic. In 2011, Missouri organic milk sales exceeded 6.95 million pounds. In value, those sales totaled $1.75 million, or an estimated $25.25 per hundredweight. Considering that the Missouri milk price received averaged $20.70 per hundredweight in 2011, the organic premium was an estimated 22 percent.

Exhibit 5.10.1 – Missouri Organic Dairy Sector, 2011

	2011 Survey
Certified organic dairy farms	9
Milk cow inventory (Dec. 31, 2011)	608
Farms selling organic products	9
Certified organic milk sales (pounds)	6,957,000
Certified organic milk sales (dollars)	$1,756,921
Estimated average milk price per cwt.	$25.25

Source: USDA, National Agricultural Statistics Service

Thirty-eight states had at least one organic farm with milk cows, and 1,848 organic farms with milk cows operated in the U.S. during 2011. U.S. organic farms had 199,737 milk cows on Dec. 31, 2011. During that year, Missouri ranked 18th for organic dairy farms and 20th for organic milk cow inventory. Exhibit 5.10.2 shares the top 10 states and Missouri based on their 2011 organic cow inventory. Note that the average estimated organic dairy farm size tended to be largest in Texas, California and Oregon. In Missouri, the average organic dairy farm maintained an estimated 67.6 organic dairy cows during 2011.

Exhibit 5.10.2 – Top 10 States and Missouri for Organic Milk Cow Inventory, Dec. 31, 2011

State	Inventory	% of U.S. Inventory	Estimated Average Cows Per Farm
California	32,939	16.5%	451.2
Texas	26,225	13.1%	3,278.1
Wisconsin	23,115	11.6%	57.9
New York	17,471	8.7%	72.5
Oregon	16,256	8.1%	378.0
Pennsylvania	11,996	6.0%	50.6
Vermont	11,813	5.9%	64.2
Minnesota	9,381	4.7%	81.6
Ohio	6,721	3.4%	49.8
Washington	6,570	3.3%	187.7
Missouri	608	0.3%	67.6

Source: USDA, National Agricultural Statistics Service

From a U.S. perspective, 1,823 certified organic dairy farms sold milk during 2011. Of those sales, the farms sold most milk as a certified organic product; however, not all milk sales from these farms were certified organic. By quantity, certified organic milk sales represented 99.8 percent of milk sales made by organic farms in 2011. Farms sold the remaining milk as conventional milk. In terms of organic milk sales, Missouri ranked 14th for sales value during 2011. Exhibit 5.10.3 lists the top 10 states by organic milk sales; note that these are certified organic farms making organic milk sales. Texas, Wisconsin and Oregon had the highest organic milk sales values in 2011. The table also approximates price per hundredweight given the organic milk sales volume and value. The U.S. estimated price per hundredweight averaged $27.35.

Exhibit 5.10.3 – Organic Milk Sales Value and Volume from Certified Organic Farms in Top 10 States and U.S., 2011

State	Sales Value	Sales Volume (pounds)	Estimated Price Per cwt.
Texas	$120,232,218	423,558,952	$28.39
Wisconsin	$82,151,746	313,298,106	$26.22
Oregon	$69,140,278	259,213,324	$26.67
New York	$60,058,757	218,121,034	$27.53
Pennsylvania	$42,579,601	148,440,277	$28.68
Vermont	$41,702,950	149,649,913	$27.87
Minnesota	$33,020,397	124,134,301	$26.60
Idaho	$25,310,940	93,922,456	$26.95
Maine	$11,264,907	39,770,451	$28.32
Iowa	$10,983,672	41,353,802	$26.56
U.S.	$763,381,231	2,791,430,858	$27.35

Source: USDA, National Agricultural Statistics Service

Production costs are significantly higher for producing organic milk compared with producing conventional milk. Exhibit 5.10.4 lists organic and conventional milk production costs for 2010. Note that USDA doesn't report costs for Missouri, so this budget presents costs for the Corn Belt region, which is composed of Missouri, Iowa, Illinois and Indiana. Relative to the conventional dairies, organic dairies incur significantly more for feed; bedding and litter; repairs; other operating costs, which include the third-party organic certification; opportunity cost of unpaid labor; capital recovery of machinery and equipment; and general farm overhead. In total, these production cost budgets suggest that organic milk production in Missouri required a 43.2 percent greater investment to produce one hundredweight of milk during 2010. On average, U.S. milk production costs were 80.3 percent higher for organic producers than conventional producers during 2010.

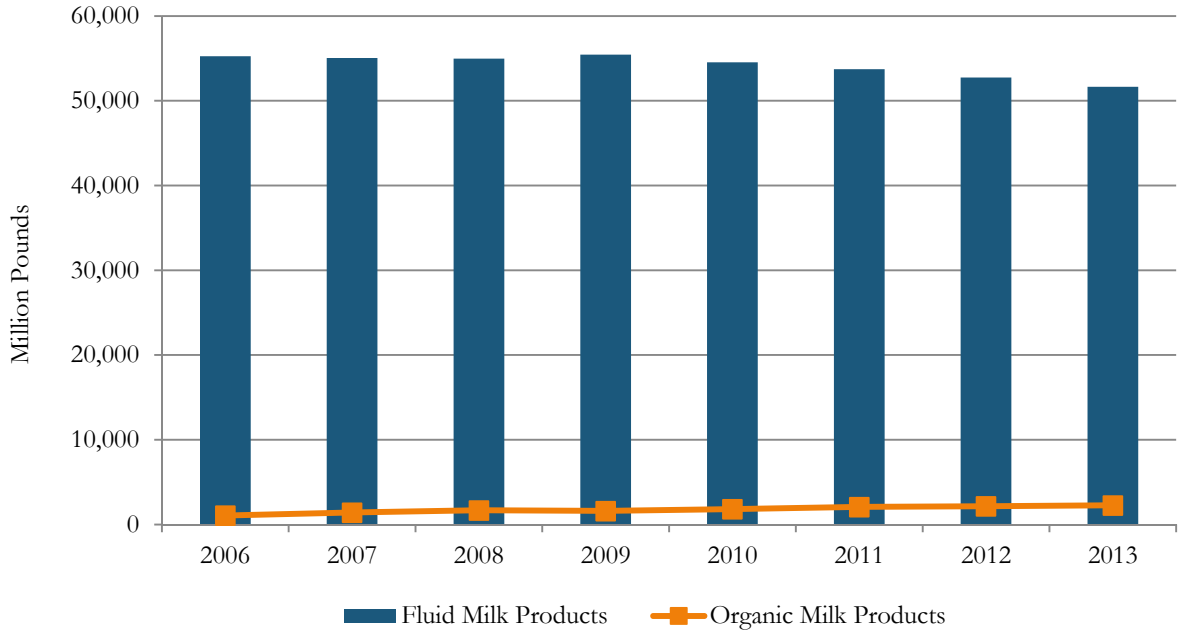
Exhibit 5.10.4 – Organic Milk Cost of Production per Cwt. Sold, 2010

	Conventional		Organic	
Item	**MO**	**U.S.**	**Corn Belt***	**U.S.**
	Dollars per hundredweight sold			
Operating costs:				
Feed--				
Purchased feed	6.57	6.09	5.37	7.08
Homegrown harvested feed	3.46	3.97	10.35	7.36
Grazed feed	0.56	0.10	0.73	0.80
Total, feed costs	10.59	10.16	16.45	15.24
Other--				
Veterinary and medicine	0.66	0.76	0.50	0.68
Bedding and litter	0.10	0.23	1.06	0.59
Marketing	0.14	0.22	0.20	0.25
Custom services	0.51	0.53	0.57	0.50
Fuel, lube, and electricity	1.03	0.66	1.50	1.20
Repairs	0.74	0.54	1.56	1.33
Other operating costs**	0.00	0.00	0.15	0.12
Interest on operating capital	0.01	0.01	0.02	0.02
Total, operating cost	13.78	13.11	22.01	19.93
Allocated overhead:				
Hired labor	0.76	1.46	0.77	2.60
Opportunity cost of unpaid labor	9.35	2.19	9.54	6.65
Capital recovery of mach. and equip.	5.07	3.28	9.22	6.71
Opportunity cost of land (rental rate)	0.19	0.02	0.20	0.10
Taxes and insurance	0.43	0.18	0.24	0.37
General farm overhead	0.58	0.58	1.22	1.17
Total, allocated overhead	16.38	7.71	21.19	17.60
Total costs listed	30.16	20.82	43.20	37.53

* Corn Belt region includes Iowa, Indiana, Illinois and Missouri.
** Costs for third-party organic certification.
Source: USDA, Economic Research Service

As indicated earlier, U.S. consumers have gradually consumed less fluid milk and cream over time. Organic milk sales, however, have grown. Exhibit 5.10.5 charts total U.S. organic fluid milk and total fluid milk product sales data from the USDA Agricultural Marketing Service. Organic milk sales represent a relatively small portion of total fluid milk product sales; however, organic's share of total fluid milk sales increased from 1.9 percent in 2006 to 4.4 percent in 2013.

Exhibit 5.10.5 – U.S. Organic and All Fluid Milk Sales, 2006 to 2013*



* These figures are based on the consumption of fluid milk products in Federal milk order marketing areas and California, which represents approximately 92 percent of total fluid milk sales in the U.S.; an estimate of total U.S. fluid milk sales is derived by interpolating the remaining 8 percent of sales from the Federal milk order and California data. Total fluid milk products include the products listed plus miscellaneous products and eggnog. Note that total fluid milk products sales volume is adjusted for calendar composition for all years but 2013.

Source: USDA, Agricultural Marketing Service and Economic Research Service

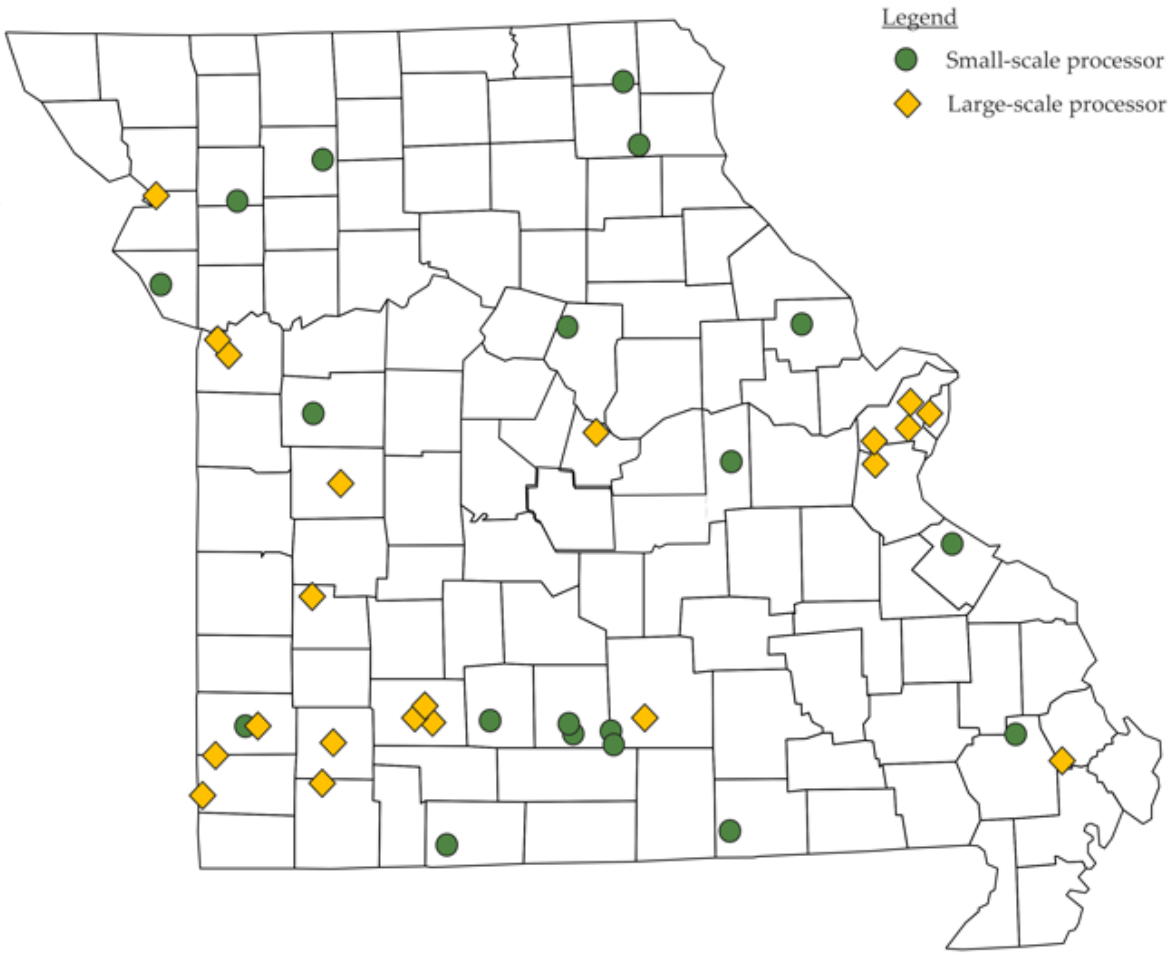
6. Dairy Product Manufacturing

6.1 Number of Plants and Location

Missouri's dairy product manufacturing industry processes dairy products from raw milk, processed milk and dairy substitutes. This industry can be divided into subsectors, which include fluid milk; creamery butter; cheese; dry, condensed and evaporated milk; and ice cream and frozen desserts.

Exhibit 6.1.1 maps the locations of Missouri dairy manufacturers. For the most part, the state's large-scale processors are located south of the Missouri River. Several plants concentrate in the southwest and south central regions. The appendix of this report includes a table with each respective plant, location, products and website. Several farmer-processors operate throughout the state. Within the past few years, Missouri dairy farmers have started such small-scale processing ventures to pursue niche marketing and directly capture more value from their milk.

Exhibit 6.1.1 –Missouri Dairy Product Plants, 2014

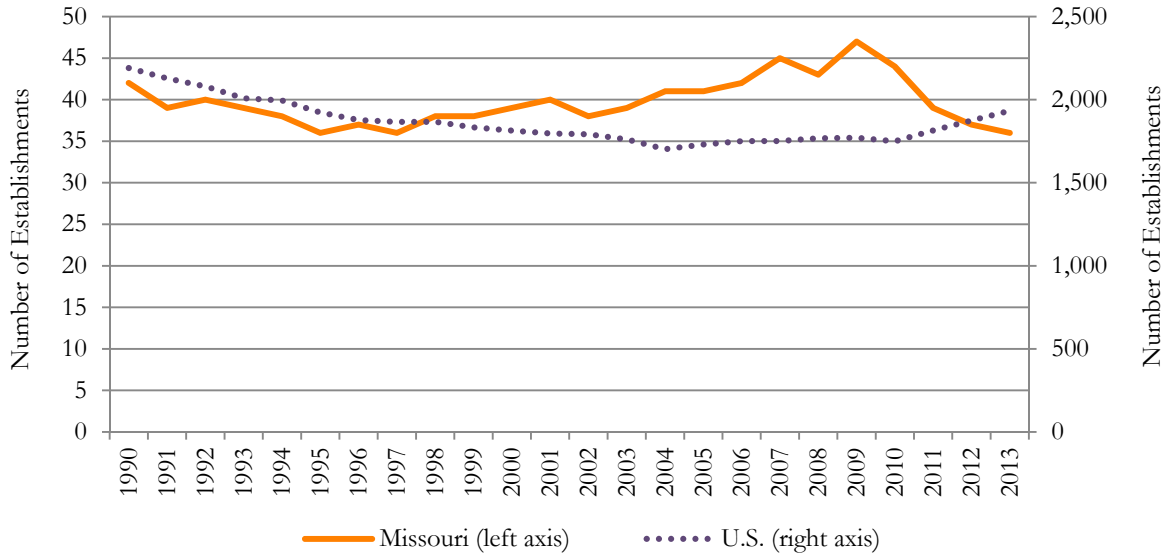


Source: Missouri State Milk Board

Fluid milk bottlers, ice cream and yogurt manufacturers tend to locate in Missouri population centers. Through dairy cooperatives, dairy farmers own the state's large milk bottling plants. These bottling plants operate under various well-known brands such Hiland in Springfield and Kansas City and Central Dairy (Prairie Farms) in Jefferson City. The Prairie Farms cooperative runs its bottling plants either directly or in joint ventures with the Dairy Farmers of America (DFA) cooperative. These same two dairy cooperatives also own additional dairy processing plants that make soft products, specialty drinks and other custom dairy products.

During the past five years, the number of dairy product manufacturing establishments increased in the U.S. but decreased in Missouri. Exhibit 6.1.2 charts the trend in dairy product establishments operating from 1990 to 2013. Dairy product manufacturing establishments in Missouri peaked at 47 establishments in 2009. By 2013, the number of Missouri dairy product manufacturing locations had dropped to 36 establishments. The number of U.S. dairy product manufacturing establishments reached its lowest level, 1,703 establishments, during 2004 and grew to 1,934 establishments by 2013. An establishment refers to a physical location that produces dairy or related products that fit within an industrial classification. A single company may own multiple establishments.

Exhibit 6.1.2 – Missouri and U.S. Dairy Product Manufacturing Establishments

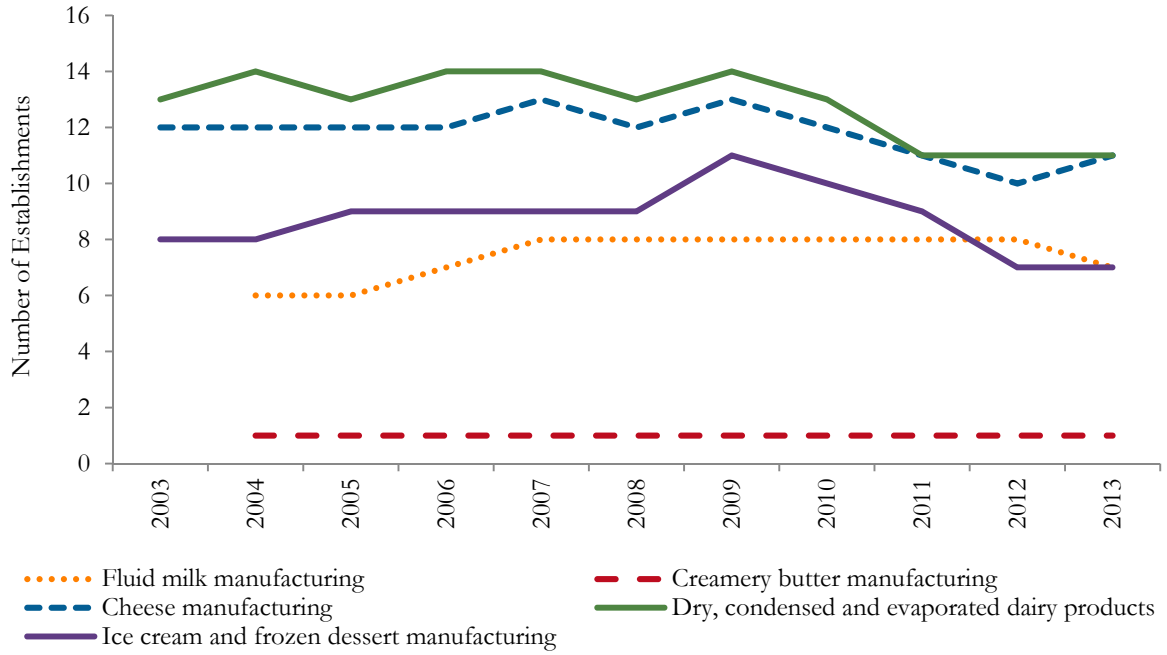


Source: U.S. Department of Labor, Bureau of Labor Statistics, Quarterly Census of Employment and Wages

The trend in the number of dairy manufacturing facilities that operate may reflect the overall food industry trend of continual concentration into fewer, larger plants that operate at higher volumes with lower cost structures. As fewer large plants represent a greater share of the packaged food market, however, smaller firms proliferate to fill market niches vacated by the expanding firms.

Several dairy product manufacturing subsectors operate in Missouri: fluid milk manufacturing; creamery butter manufacturing; cheese manufacturing; dry, condensed and evaporated dairy products; and ice cream and frozen dessert manufacturing. Exhibit 6.1.3 illustrates the trend in number of establishments for these subsectors. During the past 10 years, fewer cheese; ice cream and frozen dessert; and dry, condensed and evaporated dairy product manufacturers have operated. In 2013, the greatest number of Missouri dairy product manufacturing establishments were those who made dry, condensed and evaporated dairy products or cheese, and the fewest establishments made butter.

Exhibit 6.1.3 – Missouri Dairy Product Manufacturing Establishments by Sector

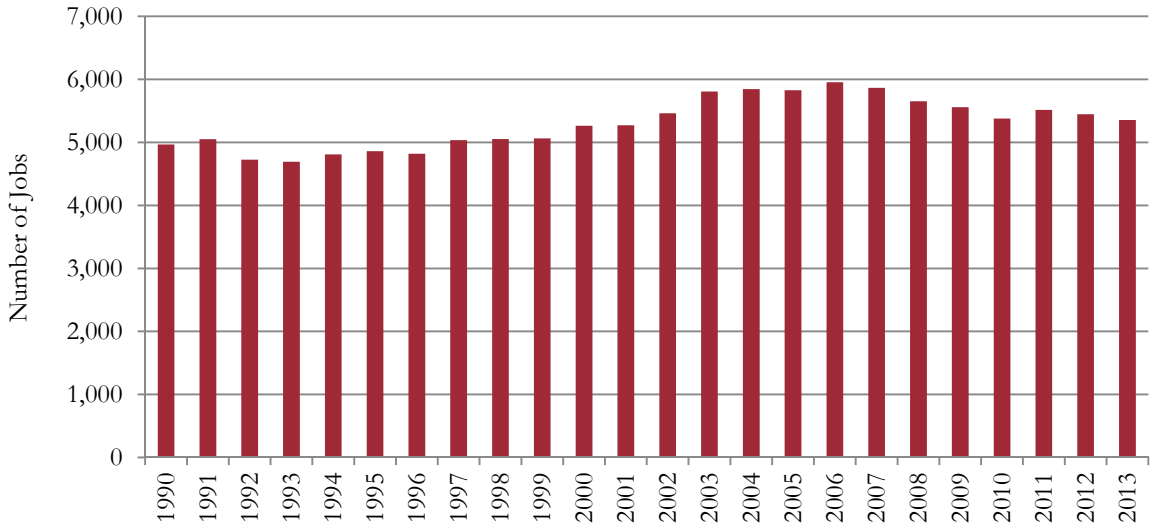


Source: U.S. Department of Labor, Bureau of Labor Statistics, Quarterly Census of Employment and Wages

6.2 Employment and Wages

The U.S. Bureau of Labor Statistics reports statistics on establishments, employee numbers and wages for Missouri dairy manufacturing sectors. Since 1990, the dairy product manufacturing industry in Missouri has experienced some changes in terms of annual employment. Exhibit 6.2.1 illustrates that the state's dairy manufacturing employment grew through the 1990s and peaked at 5,955 employees during 2006. Since then, the Missouri dairy product manufacturing industry has constricted. In 2013, Missouri's dairy product manufacturing industry employed 5,354 people.

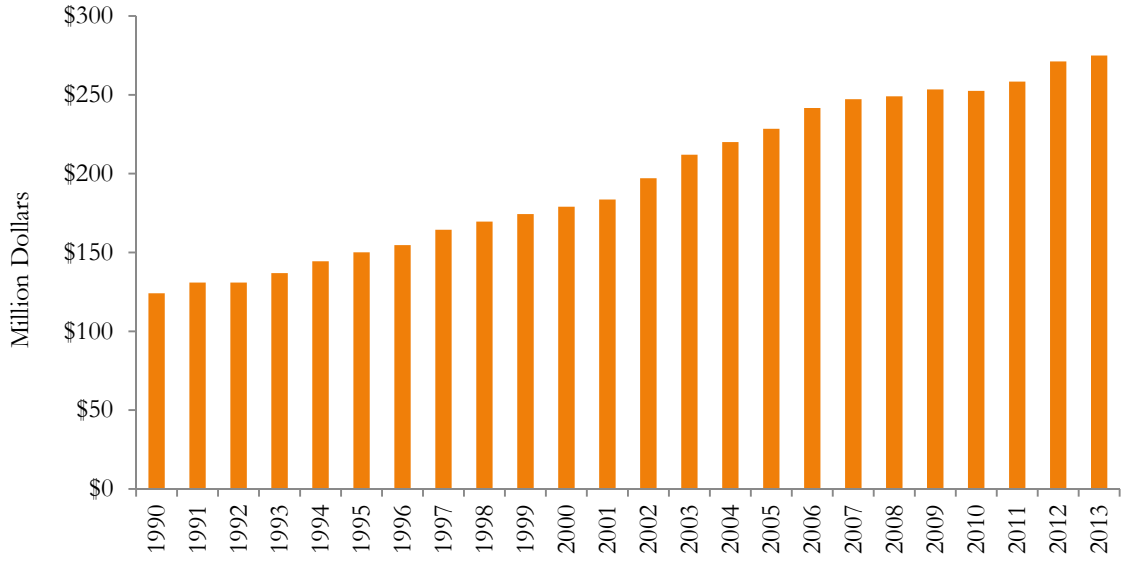
Exhibit 6.2.1 – Annual Employment for the Missouri Dairy Product Manufacturing Industry



Source: U.S. Department of Labor, Bureau of Labor Statistics, Quarterly Census of Employment and Wages

The Missouri dairy product manufacturing industry has gradually increased the wages paid to its employees. Exhibit 6.2.2 depicts the growth in annual total wages. From 1990 to 2013, total wages increased by 121.5 percent to reach $274.89 million in 2013. As an average, annual pay in the Missouri dairy product manufacturing industry totaled $51,340 in 2013.

Exhibit 6.2.2 – Annual Wages for the Missouri Dairy Product Manufacturing Industry



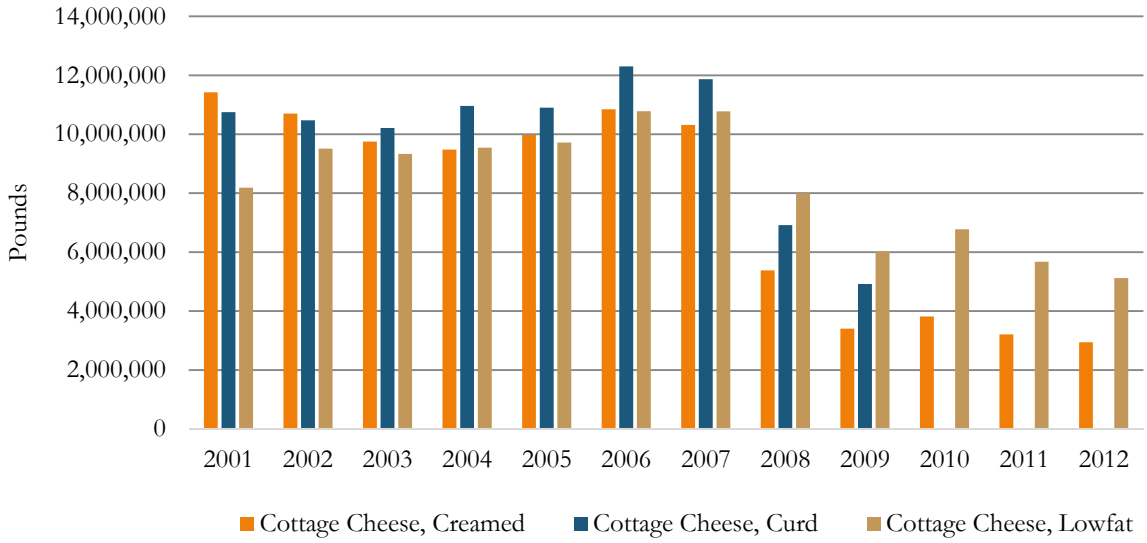
Source: U.S. Department of Labor, Bureau of Labor Statistics, Quarterly Census of Employment and Wages

6.3 Dairy Product Production

Missouri produces a variety of dairy products. This section explores the state's role in producing cottage cheese, ice cream, sherbet, cheese and butter. Relative to other states that produced dairy products in 2013, Missouri ranked third in the country for hard regular ice cream production and sixth in the country for ice cream mix production. Later discussion in this section will explain the dynamics of producing these dairy products.

Since the early 2000s, Missouri dairy cottage cheese production has declined. Exhibit 6.3.1 presents cottage cheese production data from 2001 to 2012. Between those two years, the number of Missouri plants producing cottage cheese decreased from four plants in 2001 to two plants in 2012. In the last six years analyzed, Missouri cottage cheese production facilities began to consistently produce more low-fat cottage cheese than creamed cottage cheese. During 2012, Missouri manufacturing facilities produced more than 8 million pounds of cottage cheese.

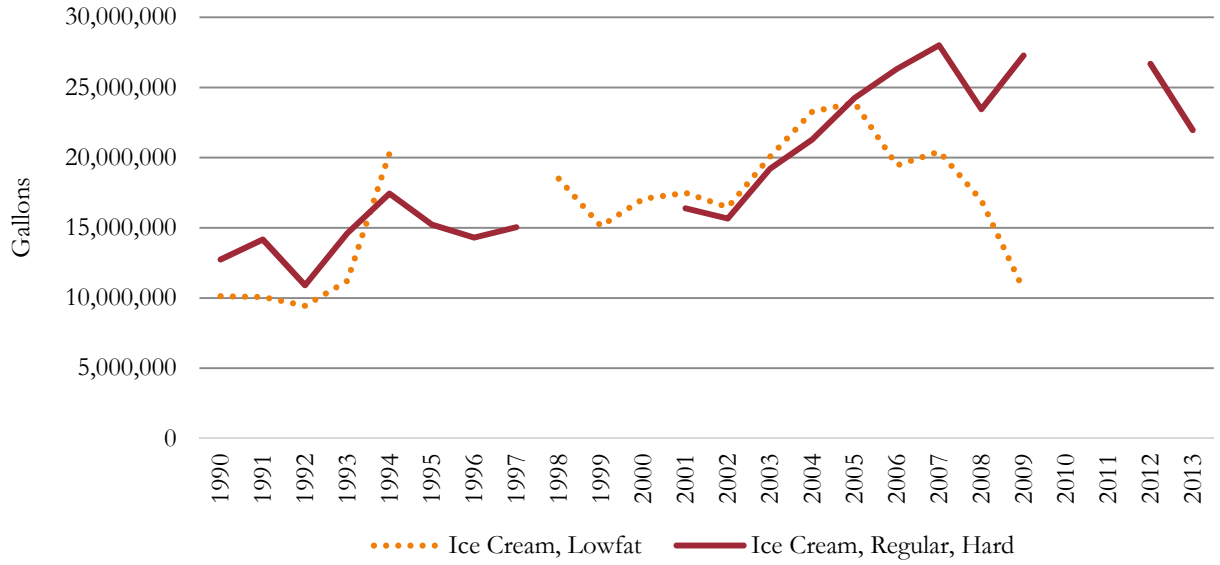
Exhibit 6.3.1 – Missouri Cottage Cheese Production, 2001 to 2012



Source: USDA, National Agricultural Statistics Service

Exhibit 6.3.2 presents the trend in Missouri ice cream production from 1990 to 2013. The chart includes production data for both low-fat hard ice cream and regular hard ice cream. 2009 is the most recent year that USDA reported the state's low-fat hard ice cream production. During that year, Missouri produced more than 10.57 million gallons of low-fat ice cream. Of the data available from USDA, Missouri regular hard ice cream production peaked during 2007. During 2013, five Missouri plants produced 21.97 million gallons of hard regular ice cream.

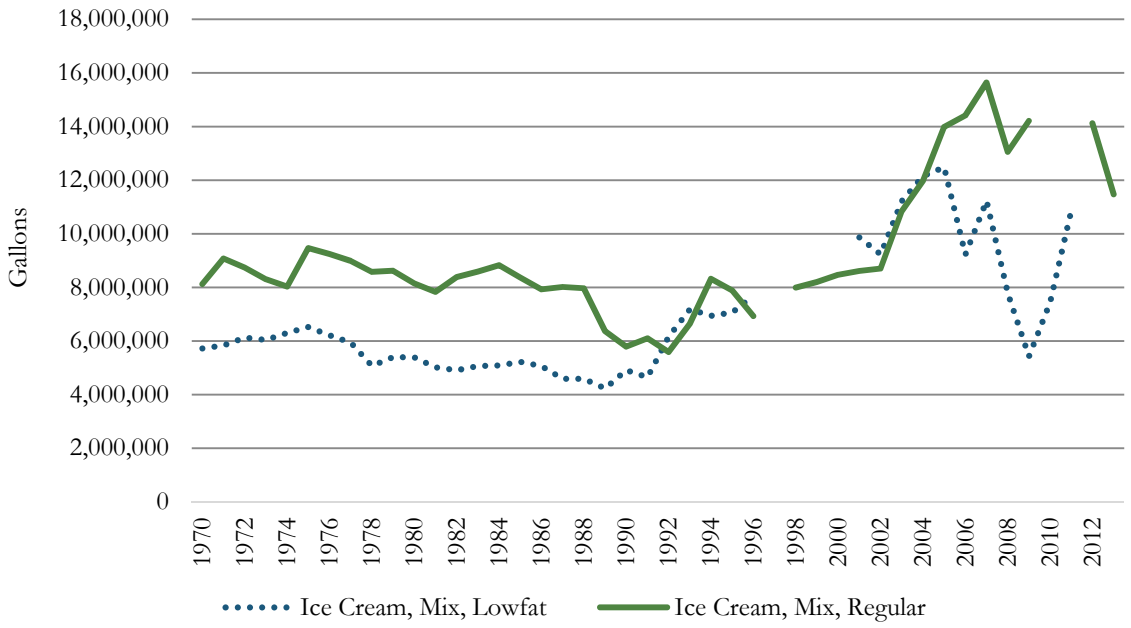
Exhibit 6.3.2 – Missouri Ice Cream Production, 1990 to 2013



Source: USDA, National Agricultural Statistics Service

Ice cream mix is another ice cream-related product that originates from Missouri dairy plants. Exhibit 6.3.3 charts low-fat ice cream mix production and regular ice cream mix production from 1970 to 2013. 2011 is the year with the most recent low-fat ice cream mix data reported. In that year, five Missouri facilities produced 10.881 million gallons of low-fat ice cream mix. During 2013, Missouri regular ice cream mix production totaled 11.471 million gallons from five plants.

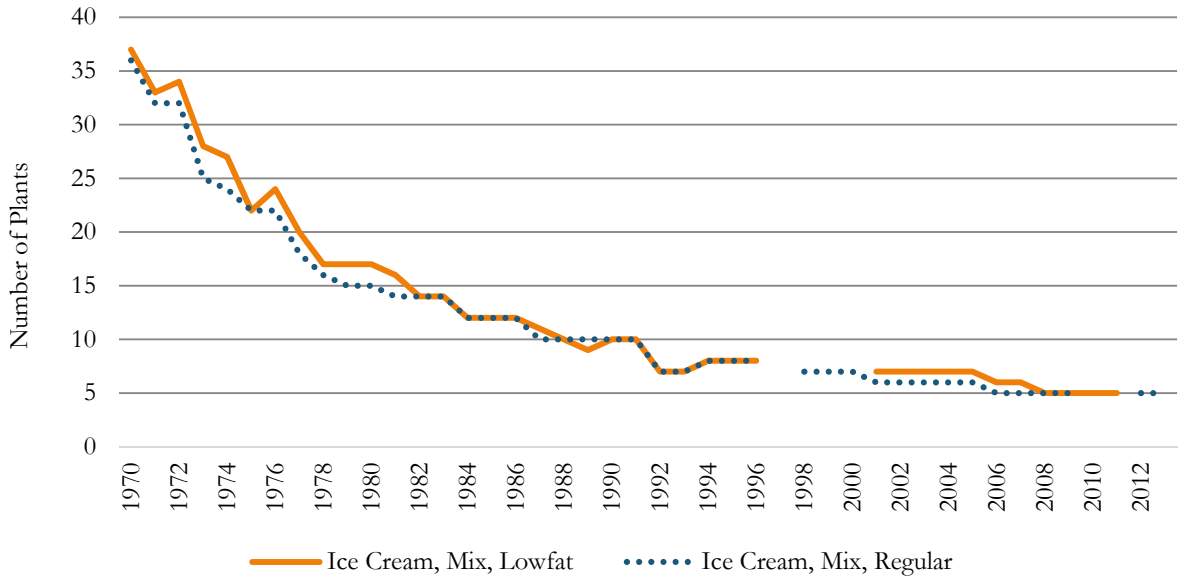
Exhibit 6.3.3 – Missouri Ice Cream Mix Production, 1970 to 2013



Source: USDA, National Agricultural Statistics Service

The number of plants producing ice cream has decreased dramatically since 1970. During 1970, 37 Missouri plants produced low-fat ice cream mix, and 36 facilities produced regular ice cream mix. These numbers dropped to five plants producing low-fat ice cream mix in 2011 and five facilities producing regular ice cream mix in 2013.

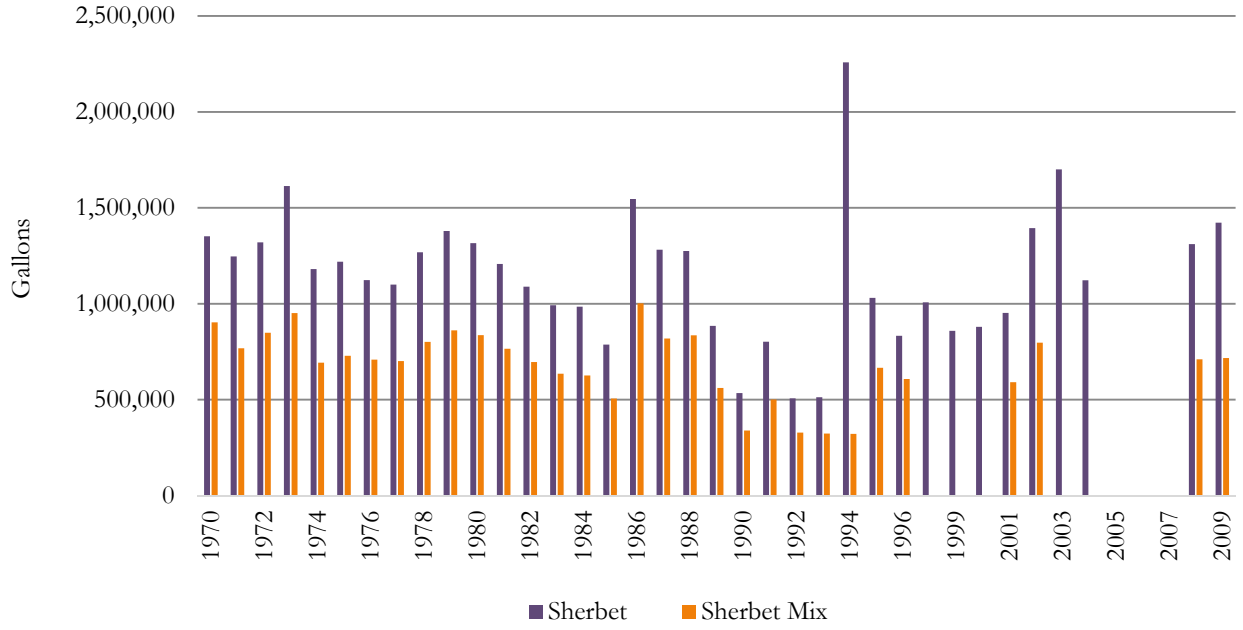
Exhibit 6.3.4 – Missouri Ice Cream Plants, 1970 to 2013



Source: USDA, National Agricultural Statistics Service

Sherbet is the third frozen dairy product with output reported for Missouri. Sherbet production in Missouri has historically exceeded sherbet mix production. Exhibit 6.3.5 illustrates Missouri sherbet production levels from 1970 to 2009. Although the state's sherbet production has varied during the observed period, production levels between 1970 and 2009 didn't differ substantially. In 2009, Missouri production output totaled 1.423 million gallons for sherbet and 717,000 gallons for sherbet mix.

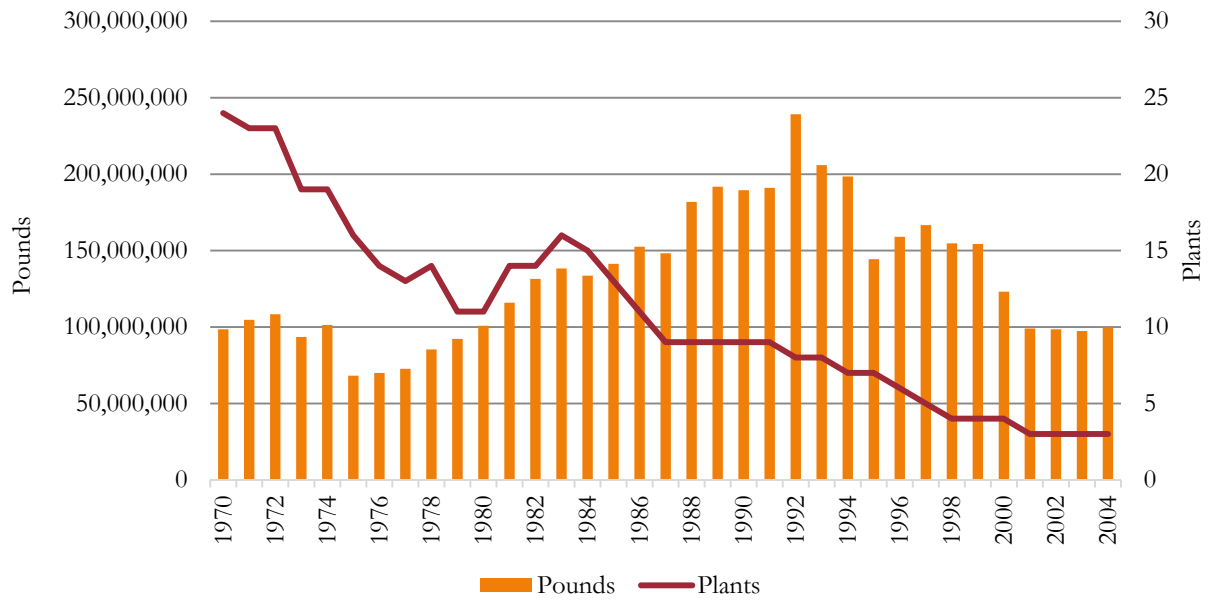
Exhibit 6.3.5 – Missouri Sherbet Production, 1970 to 2009



Source: USDA, National Agricultural Statistics Service

Since 1970, the number of Missouri plants producing cheese has steadily declined. From a cheese production perspective, however, Missouri cheese production peaked in 1992 at 239.2 million pounds, and it has since dropped. Exhibit 6.3.6 illustrates the trend in Missouri cheese production facilities that operate and the state's cheese production. During 2004, which is the most recent year with available data, three Missouri dairy plants produced more than 99.6 million pounds of cheese.

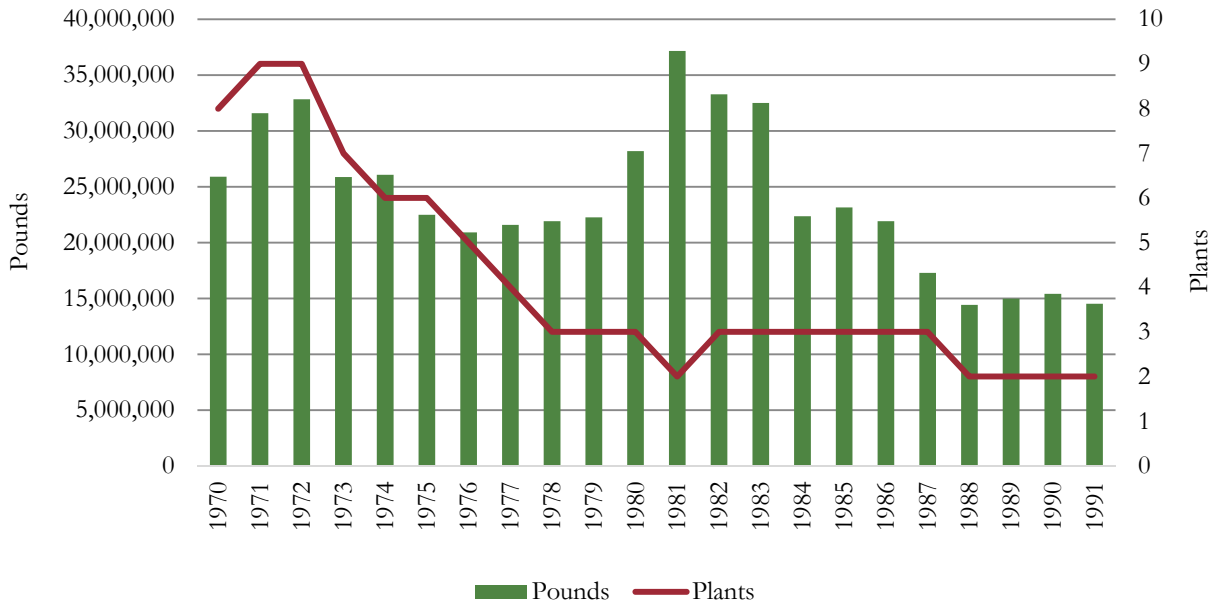
Exhibit 6.3.6 – Missouri Cheese Production and Plants, 1970 to 2004



Source: USDA, National Agricultural Statistics Service

Like the trend in Missouri cheese production facilities, fewer Missouri butter facilities have operated over time. In 1991, which is the most recent year with data available, just two butter production facilities operated in Missouri. In 1971 and 1972, nine facilities in the state produced butter. During 1991, Missouri butter production was at its second lowest level of the two decades analyzed. Butter production in Missouri totaled 14.531 million pounds during 1991.

Exhibit 6.3.7 – Missouri Butter Production and Plants, 1970 to 1991

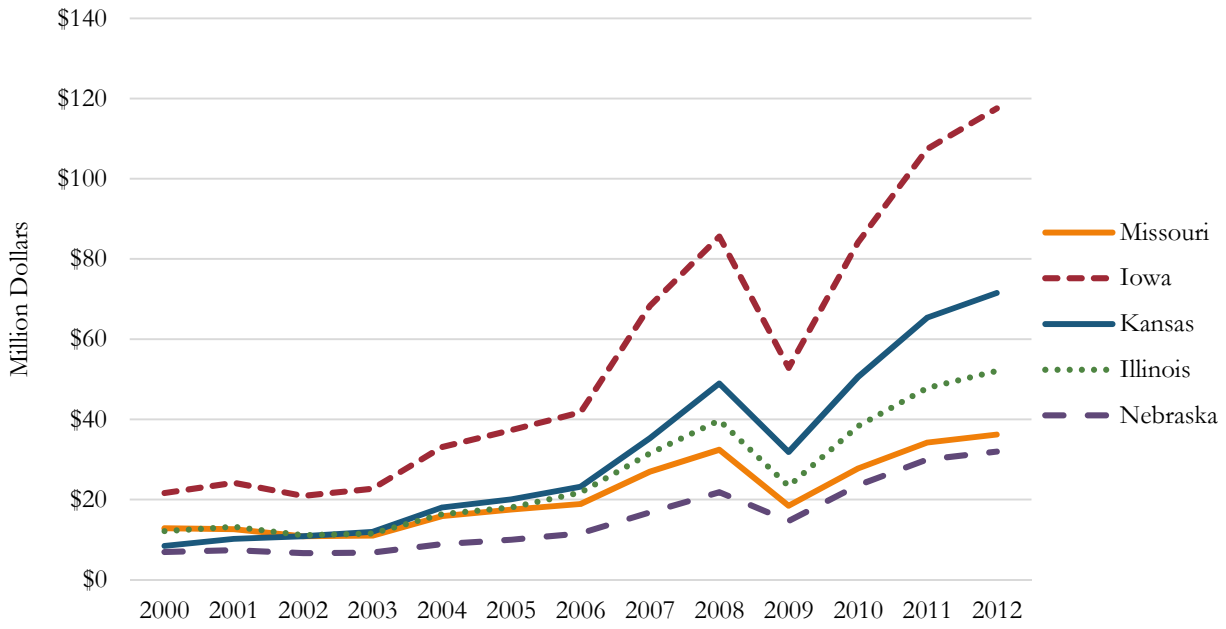


Source: USDA, National Agricultural Statistics Service

6.4 Dairy Product Exports

The USDA Economic Research Service estimates the value of state-level U.S. agricultural exports. Exhibit 6.4.1 shows dairy product export data for Missouri and surrounding states that have earned more than Missouri for dairy product exports or earned values similar to those for Missouri dairy product exports. Areas where dairy industries have grown – for example, Iowa and Kansas – have increased the value of their dairy exports more significantly than Missouri. In 2012, Missouri earned an estimated $36.2 million for its dairy product exports, and it ranked 25th among other U.S. states for the value of its dairy product exports.

Exhibit 6.4.1 – Value of Dairy Products Exports from Missouri and Selected Surrounding States, 2000 to 2012



Note: Export values are calibrated such that the sum of state export estimates for a commodity equals the total U.S. export value for the commodity.
Source: USDA, Economic Research Service

Appendix

Exhibit A1 – Missouri Dairy Cow Inventory by County, 2013

County	Inventory		County	Inventory		County	Inventory
Adair	*		Grundy	400		Pemiscot	*
Andrew	1,000		Harrison	300		Perry	1,000
Atchison	*		Henry	500		Pettis	300
Audrain	1,300		Hickory	900		Phelps	400
Barry	2,300		Holt	*		Pike	400
Barton	500		Howard	*		Platte	*
Bates	1,000		Howell	2,300		Polk	3,600
Benton	600		Iron	*		Pulaski	*
Bollinger	*		Jackson	100		Putnam	100
Boone	200		Jasper	1,900		Ralls	*
Buchanan	500		Jefferson	600		Randolph	100
Butler	*		Johnson	1,000		Ray	200
Caldwell	100		Knox	800		Reynolds	*
Callaway	600		Laclede	3,700		Ripley	*
Camden	400		Lafayette	400		Saline	*
Cape Girardeau	1,800		Lawrence	4,300		Schuyler	200
Carroll	300		Lewis	*		Scotland	2,000
Carter	*		Lincoln	500		Scott	*
Cass	500		Linn	500		Shannon	*
Cedar	700		Livingston	*		Shelby	*
Chariton	100		Macon	200		St. Charles	*
Christian	1,100		Madison	*		St. Clair	100
Clark	*		Maries	400		St. Francois	*
Clay	*		Marion	200		Ste Genevieve	100
Clinton	600		McDonald	600		St. Louis	*
Cole	600		Mercer	*		St. Louis City	*
Cooper	1,000		Miller	200		Stoddard	*
Crawford	*		Mississippi	*		Stone	1,000
Dade	700		Moniteau	1,100		Sullivan	100
Dallas	2,600		Monroe	400		Taney	200
Daviess	100		Montgomery	*		Texas	4,000
DeKalb	300		Morgan	1,500		Vernon	*
Dent	*		New Madrid	*		Warren	*
Douglas	2,600		Newton	3,800		Washington	*
Dunklin	*		Nodaway	700		Wayne	*
Franklin	1,900		Oregon	400		Webster	6,100
Gasconade	200		Osage	400		Worth	*
Gentry	300		Ozark	700		Wright	7,600
Greene	2,000						

*Not reported (No dairy cows or not reported due to USDA confidentiality rules)
Source: USDA, National Agricultural Statistics Service

Exhibit A2 – Missouri Federal Milk Marketing Dairies, Month of December by County, 2000 to 2012

County	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Adair	1	1	1	2	2	1	1	1	1	0	1	1	1
Andrew	13	14	14	13	12	12	11	12	11	11	8	7	6
Atchison	0	0	0	0	0	0	0	0	0	0	0	0	0
Audrain	8	9	9	9	11	12	12	11	12	8	3	4	4
Barry	51	45	42	41	37	36	31	28	32	31	28	29	26
Barton	9	8	6	5	5	6	4	3	4	4	4	6	4
Bates	22	18	19	14	14	15	14	12	11	9	9	8	8
Benton	13	12	10	10	10	9	9	8	14	13	8	7	6
Bollinger	2	2	2	2	0	0	0	0	0	0	0	0	0
Boone	2	2	2	2	2	2	2	2	4	2	2	4	2
Buchanan	6	5	4	4	4	3	3	3	3	4	2	2	2
Butler	0	0	0	0	0	0	0	0	0	0	0	0	0
Caldwell	2	2	2	2	2	2	3	2	0	1	1	2	2
Callaway	4	4	4	4	4	3	3	2	2	1	0	0	0
Camden	8	9	7	8	7	7	8	8	8	7	6	5	3
Cape Girardeau	24	20	22	23	22	21	20	15	15	14	15	13	14
Carroll	4	3	3	3	3	3	3	3	1	1	1	2	1
Carter	2	1	1	1	1	1	1	0	0	0	0	0	0
Cass	10	7	7	9	8	7	7	6	6	6	5	4	3
Cedar	9	10	10	11	11	11	9	8	7	6	5	5	7
Chariton	1	1	1	2	2	2	1	2	0	0	0	0	0
Christian	51	38	36	34	32	31	32	27	26	30	30	26	23
Clark	0	0	0	0	0	0	0	0	0	0	0	0	0
Clay	0	0	0	0	0	0	0	0	0	0	0	0	0
Clinton	6	6	5	4	5	5	2	4	3	3	3	3	3
Cole	6	3	4	5	1	0	1	7	0	100	9	9	9
Cooper	5	5	6	6	5	7	7	5	4	6	5	7	4
Crawford	0	0	0	0	0	0	0	0	0	0	0	0	0
Dade	10	8	8	7	5	5	7	6	6	6	6	4	5
Dallas	69	64	63	59	52	52	49	47	44	44	41	38	34
Davies	8	7	6	6	6	6	8	6	5	6	7	8	10
De Kalb	5	6	5	4	4	2	4	2	3	2	2	1	1
Dent	2	2	2	1	1	1	1	1	0	0	0	0	0
Douglas	83	86	82	81	74	70	70	57	58	55	52	50	41
Dunklin	0	0	0	0	0	0	0	0	0	0	0	0	0
Franklin	17	16	16	15	15	15	15	14	13	13	13	13	13
Gasconade	0	0	2	2	2	2	1	1	1	3	3	2	2
Gentry	0	0	0	0	0	0	0	0	0	1	0	0	0

County	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Greene	40	38	39	38	34	37	34	28	26	22	22	21	17
Grundy	8	6	6	6	6	6	6	7	7	8	2	6	6
Harrison	4	4	3	4	4	3	3	3	0	1	1	1	1
Henry	6	6	5	7	6	6	6	5	4	4	4	3	3
Hickory	10	10	10	8	8	8	7	7	7	7	6	6	4
Holt	1	1	0	0	0	0	0	0	0	0	0	0	0
Howard	2	2	2	2	1	1	1	1	0	0	0	0	0
Howell	65	64	57	56	53	51	48	40	40	32	34	27	20
Iron	0	0	0	0	0	0	0	0	0	0	0	0	0
Jackson	1	1	1	1	2	2	2	1	0	1	1	2	1
Jasper	34	30	24	22	20	18	20	17	18	16	13	12	11
Jefferson	9	9	8	9	9	7	7	5	4	4	4	6	4
Johnson	10	10	10	10	10	8	8	8	3	5	5	5	5
Knox	11	11	12	13	12	11	11	11	12	11	11	11	11
Laclede	93	83	87	77	77	71	70	56	56	60	55	42	40
Lafayette	17	16	15	14	12	10	9	9	1	7	6	6	5
Lawrence	91	90	86	81	79	78	77	73	75	83	79	72	64
Lewis	3	4	3	3	3	3	3	3	2	3	2	2	2
Lincoln	9	9	10	8	9	9	7	5	4	4	4	3	3
Linn	8	8	8	7	6	8	9	10	8	9	3	7	6
Livingston	1	1	1	1	0	1	0	1	0	2	2	5	5
Macon	0	0	0	0	0	0	0	0	1	0	0	0	0
Madison	0	0	0	0	0	0	0	0	0	0	0	0	0
Maries	1	1	4	4	3	3	2	1	3	3	3	3	3
Marion	6	6	6	5	5	5	5	4	4	3	2	2	1
McDonald	23	20	17	15	16	15	12	9	9	7	6	6	5
Mercer	1	1	0	0	1	0	0	1	1	1	1	1	1
Miller	1	1	3	2	1	0	0	1	0	1	1	1	1
Mississippi	0	1	1	1	1	1	0	0	0	0	0	0	0
Moniteau	14	16	15	12	5	2	3	8	6	27	23	23	23
Monroe	8	8	6	7	9	8	8	9	7	6	6	6	5
Montgomery	2	2	3	4	1	2	2	2	5	2	2	2	3
Morgan	35	33	32	19	13	9	11	19	13	45	37	39	38
New Madrid	0	0	0	0	0	0	0	1	1	1	0	0	0
Newton	39	35	32	32	29	29	28	27	24	25	25	22	19
Nodaway	5	5	6	6	7	8	8	8	8	6	6	4	3
Oregon	16	13	13	10	10	10	9	8	8	6	7	7	7
Osage	6	5	7	6	6	6	2	2	0	6	6	6	5
Ozark	53	37	40	40	36	29	28	25	25	21	21	20	15
Pemiscot	0	0	0	0	0	0	0	0	0	0	0	0	0

County	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Perry	19	17	18	17	17	16	16	16	17	15	14	12	14
Pettis	12	11	10	9	4	5	4	3	3	3	2	1	2
Phelps	2	2	4	5	4	4	4	4	2	1	0	0	0
Pike	1	1	1	1	1	1	1	1	1	2	2	1	2
Platte	0	0	0	0	0	0	0	0	0	0	0	0	0
Polk	62	58	54	54	54	53	50	45	48	42	41	36	33
Pulaski	2	0	1	1	1	1	1	1	1	1	1	1	1
Putnam	1	1	2	3	3	3	2	2	2	2	1	0	0
Ralls	1	1	1	1	1	1	1	1	1	1	1	1	1
Randolph	0	0	0	2	1	1	0	0	0	0	0	0	0
Ray	4	4	4	3	2	2	2	3	0	1	1	1	1
Reynolds	0	0	0	0	0	0	0	0	0	0	0	0	0
Ripley	0	0	0	0	0	0	0	0	0	0	1	1	0
Saline	2	2	2	2	2	2	2	1	0	1	1	1	1
Schuyler	4	4	4	3	3	2	2	2	2	2	3	3	2
Scotland	39	36	36	38	38	38	38	36	36	39	39	39	41
Scott	1	1	0	0	0	1	1	1	1	1	0	1	0
Shannon	3	3	3	3	3	2	2	2	2	2	2	1	1
Shelby	2	2	3	2	2	2	2	1	0	0	0	0	0
St. Charles	3	3	3	3	3	3	3	3	3	3	2	2	2
St. Clair	6	4	4	4	4	4	3	3	2	2	2	1	1
St. Francois	6	4	0	0	0	0	0	1	0	0	0	0	0
St. Louis	0	0	0	0	0	0	0	0	0	0	0	0	0
Ste. Genevieve	2	2	2	2	2	2	2	0	0	0	0	0	0
Stoddard	0	0	0	0	0	0	0	0	0	0	0	0	1
Stone	35	31	30	28	27	24	24	25	25	25	24	21	19
Sullivan	1	1	1	1	1	1	1	1	1	1	1	1	1
Taney	7	5	5	4	3	3	3	3	3	3	3	3	3
Texas	81	77	71	68	62	56	60	56	58	59	56	57	52
Vernon	4	3	3	2	2	2	4	5	7	6	6	5	4
Warren	1	1	0	0	0	0	0	0	0	0	0	0	0
Washington	0	0	0	0	0	0	0	0	0	0	0	0	0
Wayne	0	0	0	0	0	0	0	0	0	0	0	0	0
Webster	132	124	116	105	107	95	88	87	83	89	86	74	67
Worth	0	0	0	0	0	0	0	1	1	1	1	1	1
Wright	217	198	196	186	175	164	152	144	141	130	130	122	108

Exhibit A3 – Missouri Federal Milk Average Marketing Per Farm, Month of December by County, 2000 to 2012

County	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Adair	31,260	38,609	30,559	45,995	33,117	30,781	79,915	35,355	20,234	0	137,006	138,730	168,595
Andrew	88,852	86,042	103,284	100,680	95,579	102,715	115,198	94,987	89,084	91,224	87,541	87,451	98,012
Atchison	0	0	0	0	0	0	0	0	0	0	0	0	0
Audrain	100,891	97,179	93,128	86,809	84,640	76,998	73,269	75,805	68,884	88,090	96,768	94,417	94,900
Barry	84,387	88,184	91,840	107,697	104,280	101,754	106,489	106,628	111,516	108,182	109,848	96,962	104,266
Barton	69,641	83,844	103,286	107,685	108,688	92,653	135,248	121,537	113,689	99,509	90,503	137,664	356,408
Bates	76,883	84,210	78,946	93,465	84,943	80,354	92,079	99,341	122,961	111,064	85,199	100,312	64,113
Benton	84,599	69,785	83,660	87,801	101,885	91,137	87,490	97,105	56,694	55,753	56,995	84,827	69,228
Bollinger	64,403	48,084	64,059	60,032	0	0	0	0	0	0	0	0	0
Boone	252,691	203,543	210,582	177,656	65,684	29,130	173,643	62,369	78,283	269,992	277,614	132,683	229,783
Buchanan	113,010	138,153	135,020	150,089	150,763	203,148	224,862	183,772	183,488	130,080	273,327	64,552	179,953
Butler	0	0	0	0	0	0	0	0	0	0	0	0	0
Caldwell	142,699	139,087	154,410	145,286	160,657	134,106	103,802	116,642	0	5,842	158,289	98,845	90,670
Callaway	166,760	299,697	302,383	288,104	277,839	369,762	274,849	557,284	509,695	595,602	0	0	0
Camden	56,505	53,215	60,618	64,226	64,015	73,671	74,624	85,866	52,972	72,143	57,368	41,758	73,609
Cape Girardeau	146,736	154,986	142,960	144,194	150,385	151,385	167,298	172,186	176,792	192,833	179,321	218,504	200,753
Carroll	89,454	57,750	53,526	67,524	60,752	72,254	76,354	49,283	19,902	26,759	15,400	73,279	21,829
Carter	77,106	47,207	93,418	97,700	77,761	78,186	56,688	0	0	0	0	0	0
Cass	72,942	94,322	90,209	69,522	71,704	76,384	76,359	66,074	96,170	86,614	72,213	87,052	126,637
Cedar	71,108	88,967	77,718	77,334	69,823	81,069	93,645	87,454	100,894	109,928	126,944	92,072	84,435
Chariton	112,327	119,771	112,787	56,592	62,311	62,694	89,640	59,842	0	0	0	0	0
Christian	65,163	78,037	72,650	73,863	76,464	76,261	89,471	87,477	86,982	90,643	78,893	90,263	85,243
Clark	0	0	0	0	0	0	0	0	0	0	0	0	0
Clay	0	0	0	0	0	0	0	0	0	0	0	0	0
Clinton	33,464	57,296	62,577	52,758	57,786	48,802	68,822	30,471	38,360	42,333	48,595	41,057	41,149
Cole	32,932	51,267	22,980	21,323	3,551	0	8,890	6,354	0	10,479	100,812	105,383	104,330
Cooper	121,644	103,638	111,503	104,542	140,954	55,485	88,798	100,482	96,223	119,476	133,889	90,194	176,509
Crawford	0	0	0	0	0	0	0	0	0	0	0	0	0
Dade	88,324	90,539	82,390	84,988	120,327	184,320	165,899	165,875	170,511	152,775	141,592	133,780	103,170
Dallas	76,906	75,015	76,783	80,580	81,811	97,303	100,479	95,894	83,169	91,390	91,258	83,797	101,139
Davies	46,752	47,231	46,431	44,606	50,186	43,358	60,035	33,411	26,106	1,350	34,417	42,342	42,278
De Kalb	93,464	86,241	93,143	89,000	84,298	35,987	56,512	28,985	53,706	69,773	59,488	99,128	40,792
Dent	40,818	41,695	25,925	45,946	23,313	25,035	23,010	20,610	0	0	0	0	0
Douglas	62,524	66,451	63,206	66,933	68,339	75,082	73,655	70,005	68,488	70,313	75,568	69,691	87,185
Dunklin	0	0	0	0	0	0	0	0	0	0	0	0	0
Franklin	167,792	197,200	203,309	212,867	240,450	238,764	2,304,315	218,529	237,883	260,155	255,609	270,703	289,356

County	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Gasconade	0	0	101,013	110,303	109,492	100,713	86,280	94,400	4,935	74,690	71,867	120,732	134,484
Gentry	0	0	0	0	0	0	0	0	0	9,172	0	0	0
Greene	80,292	88,745	90,459	88,642	103,511	103,832	109,694	91,305	88,779	102,858	93,168	78,682	110,507
Grundy	94,020	117,403	116,459	109,783	114,935	104,778	93,820	95,239	70,460	88,716	432,810	110,811	92,303
Harrison	57,576	49,668	65,160	61,800	50,474	75,948	92,860	68,855	0	2,093	106,108	90,653	85,351
Henry	136,072	92,556	110,996	79,998	78,285	84,804	93,501	83,951	97,936	102,350	94,355	131,847	136,440
Hickory	83,407	87,244	91,677	91,876	85,935	87,843	115,018	103,976	111,151	113,000	123,671	129,763	143,096
Holt	67,279	66,416	0	0	0	0	0	0	0	0	0	0	0
Howard	115,883	81,662	85,450	89,388	70,317	51,833	52,711	27,821	0	0	0	0	0
Howell	95,875	94,066	100,296	93,895	87,005	99,145	94,212	91,595	84,660	74,717	69,530	73,914	51,137
Iron	0	0	0	0	0	0	0	0	0	0	0	0	0
Jackson	65,783	62,566	54,765	49,200	90,759	89,644	47,917	61,877	0	73,290	40,215	27,444	42,156
Jasper	118,061	134,497	128,436	118,217	175,211	222,060	199,354	162,599	164,915	110,575	114,902	85,761	156,102
Jefferson	148,207	159,210	174,603	136,584	134,250	182,146	171,428	206,537	203,856	223,325	211,559	124,199	176,916
Johnson	80,035	111,356	88,179	73,260	73,217	86,765	84,453	66,305	56,768	85,533	79,333	77,550	80,910
Knox	77,735	80,202	75,815	83,145	89,071	95,848	103,313	98,999	87,306	101,822	100,110	100,607	118,194
Laclede	86,817	87,784	86,657	95,237	87,577	94,912	94,687	102,551	95,937	83,433	83,354	95,521	98,385
Lafayette	89,759	97,276	94,779	79,955	76,874	83,295	95,679	77,597	37,679	95,121	159,879	241,122	292,334
Lawrence	95,615	92,013	95,078	98,641	110,106	114,855	108,842	115,374	117,776	104,144	108,337	111,568	106,916
Lewis	1,587,644	1,403,165	2,006,152	2,281,998	2,287,230	2,078,776	1,739,530	1,389,117	52,955	1,882,839	2,821,213	3,467,783	4,060,104
Lincoln	161,657	161,917	134,950	173,219	168,327	170,510	154,096	178,253	191,250	186,758	168,692	210,014	186,829
Linn	92,059	85,863	102,117	93,981	98,722	84,138	81,155	76,020	77,332	63,822	137,436	68,431	64,038
Livingston	24,770	37,212	34,718	57,314	0	35,207	0	49,368	0	53,710	160,227	65,896	62,640
Macon	0	0	0	0	0	0	0	0	78,607	0	0	0	0
Madison	0	0	0	0	0	0	0	0	0	0	0	0	0
Maries	112,118	88,960	147,557	156,953	121,697	106,669	93,495	85,928	8,467	124,201	108,712	108,453	118,098
Marion	78,764	70,571	77,850	59,146	59,466	47,997	47,975	45,542	64,076	78,007	65,968	66,813	104,159
McDonald	69,477	83,590	70,982	88,859	93,797	94,316	98,061	103,893	103,747	115,260	111,883	88,199	132,324
Mercer	29,903	26,324	0	0	4,342	0	0	66,197	47,916	77,984	50,288	74,282	85,521
Miller	59,624	47,230	62,814	45,649	7,483	0	0	5,054	0	57,894	57,201	56,815	62,384
Mississippi	0	17,800	24,945	19,366	15,256	14,970	0	0	0	0	0	0	0
Moniteau	35,467	19,666	59,350	9,803	20,047	39,634	36,384	12,030	32,882	43,280	49,129	52,435	50,966
Monroe	97,864	87,350	119,307	118,929	80,472	109,044	123,380	88,937	116,324	121,614	101,321	126,466	122,412
Montgomery	88,623	83,440	75,791	73,174	98,027	67,129	81,476	70,235	31,655	67,426	74,962	71,888	32,359
Morgan	26,006	23,417	52,393	18,190	27,317	59,745	53,638	22,973	72,356	66,373	71,560	69,566	70,526
New Madrid	0	0	0	0	0	0	0	3,424	516,504	1,031,380	0	0	0
Newton	80,053	83,680	87,747	80,832	96,997	112,585	103,264	93,789	91,950	80,003	75,656	83,834	80,371
Nodaway	61,047	57,047	75,480	62,359	62,430	59,373	58,817	54,125	63,089	48,237	46,212	51,952	73,812
Oregon	78,394	92,061	87,032	99,529	99,048	93,529	81,011	99,369	104,347	116,073	86,748	81,077	57,551
Osage	105,911	82,597	85,896	77,763	87,265	95,509	94,630	87,598	0	125,221	118,276	108,677	145,596

County	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ozark	70,661	80,797	85,337	87,570	91,806	82,377	88,965	72,616	70,151	77,113	73,608	84,882	94,777
Pemiscot	0	0	0	0	0	0	0	0	0	0	0	0	0
Perry	102,841	103,495	86,531	88,379	94,518	100,129	95,419	92,930	88,850	90,164	87,224	109,295	92,830
Pettis	62,421	70,221	60,794	65,774	81,288	74,007	162,443	96,417	99,402	83,607	98,319	196,637	82,891
Phelps	142,660	122,683	58,825	61,149	73,563	65,444	74,858	51,452	4,351	69,910	0	0	0
Pike	102,850	68,165	79,965	68,435	50,415	50,214	63,769	85,950	91,271	60,902	83,035	74,630	53,658
Platte	0	0	0	0	0	0	0	0	0	0	0	0	0
Polk	109,157	111,156	134,314	131,566	132,957	153,055	140,880	125,660	117,096	156,259	147,979	126,481	182,440
Pulaski	21,699	0	292,708	354,682	226,704	152,232	358,481	319,747	347,744	341,272	279,424	247,714	262,226
Putnam	16,761	14,861	56,728	56,611	76,347	57,374	62,629	59,750	50,293	45,792	58,367	0	0
Ralls	96,202	91,234	90,533	93,023	104,288	100,721	117,944	91,714	80,128	88,300	58,054	72,313	61,693
Randolph	0	0	0	56,175	74,477	84,748	0	0	0	0	0	0	0
Ray	50,877	40,820	49,861	51,126	53,043	54,894	71,707	35,517	0	105,826	84,871	72,685	85,912
Reynolds	0	0	0	0	0	0	0	0	0	0	0	0	0
Ripley	0	0	0	0	0	0	0	0	0	0	45,622	48,970	0
Saline	85,878	76,667	72,298	65,825	67,351	130,750	109,601	172,168	0	271,103	293,069	266,573	241,384
Schuyler	65,127	64,591	65,897	52,420	42,200	55,641	60,431	51,033	53,404	52,367	60,613	68,073	84,493
Scotland	82,376	87,850	89,747	93,828	98,338	101,677	107,734	108,625	113,649	108,663	111,602	117,045	116,513
Scott	9,919	17,744	0	0	0	50,166	96,425	475,928	478,140	401,228	0	0	0
Shannon	72,195	61,196	76,298	52,241	42,555	70,474	24,874	31,898	24,414	28,342	28,815	16,026	8,458
Shelby	87,189	95,031	118,803	128,406	164,527	188,105	165,773	103,282	0	0	0	0	0
St. Charles	387,512	331,425	310,901	372,178	401,585	401,720	372,787	421,342	418,675	442,332	577,050	582,783	515,730
St. Clair	54,219	77,235	52,395	45,808	51,427	43,592	51,271	35,670	30,169	34,570	30,896	36,088	27,993
St. Francois	79,985	67,049	0	0	0	0	0	0	0	0	0	0	0
St. Louis	0	0	0	0	0	0	0	0	0	0	0	0	0
Ste. Genevieve	75,565	79,211	90,426	82,446	89,613	66,117	78,615	0	0	0	0	0	0
Stoddard	0	0	0	0	0	0	0	0	0	0	0	0	301,700
Stone	80,618	82,203	81,838	90,609	92,610	102,343	92,571	77,207	85,445	69,689	73,976	79,212	83,240
Sullivan	38,608	34,460	45,909	46,986	37,906	52,206	64,615	66,179	51,621	55,613	52,851	54,745	54,781
Taney	50,726	45,075	30,581	40,138	63,621	66,789	51,825	48,408	42,218	45,174	57,954	65,460	52,803
Texas	82,620	85,711	91,952	93,467	92,966	99,861	94,565	92,606	91,615	97,227	97,191	95,144	91,168
Vernon	98,684	63,118	53,846	71,170	73,804	118,874	583,446	547,238	430,036	584,927	485,931	338,482	343,329
Warren	155,043	137,435	0	0	0	0	0	0	0	0	0	0	0
Washington	0	0	0	0	0	0	0	0	0	0	0	0	0
Wayne	0	0	0	0	0	0	0	0	0	0	0	0	0
Webster	77,602	80,322	85,321	94,782	73,824	94,849	96,503	87,349	89,845	92,829	82,097	75,991	91,979
Worth	0	0	0	0	0	0	0	27,213	37,854	46,844	42,543	31,384	32,372
Wright	77,296	89,148	81,200	87,434	90,089	98,345	100,806	93,331	88,605	94,880	88,929	92,157	98,951

Exhibit A4 – Missouri Dairy Product Manufacturing Plant, City, Products and Website

Plant	City	Products	Website
Baetje Farms	Bloomsdale	Goat and sheep milk and cheese	www.baetjefarms.com/
Belfonte	Kansas City	Ice cream, yogurt, cottage cheese, sour cream & dips, milk, juices and creams	www.belfontedairy.com
Borgman's Dairy Farm	Holden	Cheese, cajeta	www.borgmansdairyfarm.com/
College of the Ozarks	Point Lookout	Milk and milk product	www.cofo.edu/page/students/academic-programs/agriculture/farms-work-stations.383.html
Dairiconcepts	Eldorado Springs	Cheese and dairy powder	www.dairiconcepts.com/
Danisco	St. Joseph	Powder	www.danisco.com/
DFA - Cabool	Cabool	Infant formula	www.dfamilk.com/
DFA - Springfield	Springfield	Sports drinks	www.dfamilk.com/
Goatsbeard Farm	Harrisburg	Goat cheese	www.goatsbeardfarm.com/
Golden L Creamery	Silex	Cheese	www.goldenlcreamery.com/
Good Humor Breyers Ice Cream	Sikeston	Ice cream and novelties	www.unileverusa.com/
Green Dirt Farm	Weston	Sheep cheese and yogurt	www.greendirtfarm.com/
Heartland Dairy	Newark	Cow and goat cheese	heartlandcreamery.com/
Hiland Dairy (formally Roberts Dairy)	Kansas City	Milk and milk product	www.hilanddairy.com/
Hiland Dairy	Springfield	Milk and milk product	www.hilanddairy.com/
Homestead Dairy	Jamesport	Cheese	
International Food Products Corp. (formerly Dairy House)	St. Louis	Powder	ifpc.com/
Ice Cream Specialties	St. Louis	Ice cream and novelties	www.prairiefarmsdairy.com/index.php?p=534
Jasper Products	Joplin	Sports drinks	www.jasperproducts.com/
Kraft, Inc.	Springfield	Cheese	www.kraftfoodsgroup.com/
M & T Farms	Owensville	Cheese	http://www.coolcowcheese.com/
Madison Farms	St. Louis	Butter	www.prairiefarmsdairy.com/index.php?p=540
Marlee's Creamery	Carthage	Milk	www.agrilicious.org/Marlees-Creamery
Memory Lane Dairy	Fordland	Milk	www.memorylanedairy.com/
Milnot	Seneca	Condensed milk	www.milnot.com/
Oakridge Goat Dairy & Creamery	Advance	Cheese	
Ozark Mountain Creamery	Mountain Grove	Milk	ozarkmtncreamery.com/
Pacific Valley Dairy	Pacific	Yogurt, custard, ice cream	www.pvdairy.com/
Prairie Farms (Central Dairy)	Jefferson City	Milk and milk product	www.centraldairy.biz/
Real Farm Foods	Norwood	Cheese	http://www.realfarmfoods.net/

Sanitary Dairy Foods	St. Louis	Cheese	
Schreiber Foods	Mount Vernon	Cheese	www.schreiberfoods.com/
Schreiber Foods	Carthage	Cheese	www.schreiberfoods.com/
Schreiber Foods	Monett	Cheese	www.schreiberfoods.com/
Schreiber Foods	Clinton	Cheese	www.schreiberfoods.com/
Shatto Milk Company	Osborn	Milk and milk product	www.shattomilk.com/
Springhill Dairy	Mountain Grove	Cheese and yogurt	
Terrell Creek Farm	Fordland	Goat cheese	terrellcreekfarm.com/
Trickling Springs Creamery	Koshkonong	Cheese and cultured drinks	www.tricklingspringscreamery.com/
Weiler Dairy	Rutledge	Milk	

Source: Missouri State Milk Board and Missouri Department of Health and Senior Services